CITY OF BLOOMINGTON CITY COUNCIL - REGULAR SESSION MEETING OCTOBER 10, 2022

COMPONENTS OF THE COUNCIL AGENDA

RECOGNITION AND PROCLAMATION

This portion of the meeting recognizes individuals, groups, or institutions publically, as well as those receiving a proclamation, or declaring a day or event.

PUBLIC COMMENT

Each regular City Council meeting shall have a public comment period not to exceed 30 minutes. Every speaker is entitled to speak for up to 3 minutes. To be considered for public comment, please complete a public comment card at least 5 minutes prior to the start of the meeting. The Mayor will randomly draw from the cards submitted. Public comment is a time to give comment. It is not a question and answer period and the City Council does not respond to public comments. Speakers who engage in threatening or disorderly behavior will have their time ceased.

CONSENT AGENDA

All items under the Consent Agenda are considered to be routine in nature and will be enacted by one motion. There will be no separate discussion of these items unless a Council Member, City Manager or Corporation Counsel so requests; in which event, the item will be removed from the Consent Agenda and considered in the Regular Agenda, which typically begins with Item No. 8.

The City's Boards and Commissions hold Public Hearings prior to some Council agenda items appearing on the Council's Meeting Agenda. Persons who wish to address the Council should provide new information that is pertinent to the issue before them.

PUBLIC HEARING

Items that require receiving public testimony will be placed on the agenda and noticed as a Public Hearing. Individuals have an opportunity to provide public testimony on those items that impact the community and/or residence.

REGULAR AGENDA

All items that provide the Council an opportunity to receive a presentation, ask questions of City Staff, seek additional information, or deliberate prior to making a decision will be placed on the Regular Agenda.

MAYOR AND COUNCIL MEMBERS

Mayor - Mboka Mwilambwe

City Council Members

Ward 1 - Grant Walch
Ward 2 - Donna Boelen
Ward 3 - Sheila Montney
Ward 4 - Julie Emig
Ward 5 - Nick Becker
Ward 6 - De Urban
Ward 7 - Mollie Ward
Ward 8 - Jeff Crabill
Ward 9 - Tom Crumpler

City Manager - Tim Gleason
Deputy City Manager - Billy Tyus

CITY LOGO DESIGN RATIONALE

The CHEVRON Represents:
Service, Rank, and Authority
Growth and Diversity
A Friendly and Safe Community
A Positive, Upward Movement and
Commitment to Excellence!

MISSION, VISION, AND VALUE STATEMENT

MISSION
To Lead, Serve and Uplift the City of Bloomington

VISION
A Jewel of the Midwest Cities

VALUES
Service-Centered,
Results-Driven,
Inclusive

STRATEGIC PLAN GOALS

- Financially Sound City Providing Quality Basic Services
- Upgrade City Infrastructure and Facilities Grow the Local Economy
- Strong Neighborhoods
- Great Place - Livable, Sustainable City
- Prosperous Downtown Bloomington

CITY COUNCIL - REGULAR SESSION MEETING AGENDA
GOVERNMENT CENTER CHAMBERS, 4TH FLOOR, ROOM #400
115 E. WASHINGTON STREET, BLOOMINGTON, IL 61701
MONDAY, OCTOBER 10, 2022, 6:00 PM

1. **Call to Order**
2. **Pledge of Allegiance to the Flag**
3. **Remain Standing for a Moment of Silent Prayer and/or Reflection**
4. **Roll Call**
5. **Public Comment**

   Individuals wishing to provide emailed public comment must email comments to publiccomment@cityblm.org at least 15 minutes before the start of the meeting. Individuals wishing to speak in-person or remotely may register at www.cityblm.org/register at least 5 minutes before the start of the meeting for in-person public comment and at least 15 minutes before the start of the meeting for remote public comment.

6. **Recognition/Appointments**
7. **Consent Agenda**

   Items listed on the Consent Agenda are approved with one motion; Items pulled by Council from the Consent Agenda for discussion are listed and voted on separately.

   A. Consideration and action to approve Bills and Payroll in the amount of $7,455,338.61, as requested by the Finance Department. *(Recommended Motion: The proposed Bills and Payroll be approved.)*

   B. Consideration and action to approve an Intergovernmental Agreement between the City of Bloomington and Bloomington Public Schools, District 87, so that they can purchase rock salt from the City during winter 2022-2023, in the amount of the cost per ton the City paid for the rock salt plus a storage and handling, and loading fee of $5.00 per ton, not to exceed 250 tons per fiscal year, with automatic renewals through April 30, 2028, as requested by the Public Works Department. *(Recommended Motion: The proposed Intergovernmental Agreement be approved.)*

   C. Consideration and action to approve an Agreement with T2 Systems Inc., for three years, to provide hosting services for the City's T2 Flex Parking Management System for the first-year cost of $40,199.63, second-year cost of $42,209.61, and third-year cost of $44,320.11, for a total cost of $126,729.35, as requested by the Information Technology Department and the Public Works Department. *(Recommended Motion: The proposed Agreement be approved.)*

   D. Consideration and action to approve an Ordinance Approving the Final Plat of The

Grove on Kickapoo Creek Sixth Addition, subject to the petitioner providing the required sureties and tap-on fees, as requested by the Public Works Department. *(Recommended Motion: The proposed Ordinance be approved, subject to the petitioner providing the required sureties and tap-on fees.)*

E. Consideration and action to approve an Ordinance approving the Final Plat of the Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision, as requested by the Public Works Department. *(Recommended Motion: The proposed Ordinance be approved.)*

F. Consideration and action to approve an Ordinance approving the Final Plat of Third Addition to Cedar Ridge Subdivision, subject to the petitioner providing the required sureties and tap-on fees, as requested by the Public Works Department. *(Recommended Motion: The proposed Ordinance be approved, subject to the petitioner providing the required sureties and tap-on fees.)*

G. Consideration and action on an Ordinance approving the Final Plat of Route 51 Subdivision Second Addition, as requested by the Public Works Department. *(Recommended Motion: The proposed Ordinance be approved.)*

H. Consideration and action on an Ordinance Authorizing a Construction Agreement between the City of Bloomington and G. A. Rich & Sons, Inc., for Water Treatment Plant Chemical Systems Improvements (Bid #2023-06), in the amount of $1,510,850, as requested by the Public Works Department. *(Recommended Motion: The proposed Ordinance be approved.)*

8. Regular Agenda

A. Consideration and action to approve the IATSE Local 193 Contract, as requested by the Human Resources Department. *(Recommended Motion: The proposed Contract be approved.) (Presentation by Billy Tyus, Deputy City Manager, 5 minutes; and City Council Discussion, 5 minutes.)*

9. City Manager's Discussion

10. Mayor's Discussion

11. Council Member's Discussion

12. Executive Session

13. Adjournment

Individuals with disabilities planning to attend the meeting who require reasonable accommodations to observe and/or participate, or who have questions about the accessibility of the meeting, should contact the City's ADA Coordinator at 309-434-2468 or mhurt@cityblm.org.

CONSENT AGENDA ITEM NO. 7.A

FOR COUNCIL: October 10, 2022

WARD IMPACTED: City-Wide Impact

SUBJECT: Consideration and action to approve Bills and Payroll in the amount of $7,455,338.61, as requested by the Finance Department.

RECOMMENDED MOTION: The proposed Bills and Payroll be approved.

STRATEGIC PLAN LINK:
Goal 1. Financially Sound City Providing Quality Basic Services

STRATEGIC PLAN SIGNIFICANCE:
Objective 1d. City services delivered in the most cost-effective, efficient manner

BACKGROUND: Bills and Payroll are filed in the City Clerk's Department. The full Bills and Payroll Report is now housed under Finance documents on the City's website, available at https://www.cityblm.org/bills.

COMMUNITY GROUPS/INTERESTED PERSONS CONTACTED: N/A

FINANCIAL IMPACT: Total disbursements to be approved $7,455,338.61 (Payroll total $2,878,955.51, Accounts Payable total $4,310,537.06, Bank Transfers total $147,206.89, and Procurement Card Purchases total $118,639.15).

AMERICAN RESCUE PLAN FUNDING IMPACT: N/A

COMMUNITY DEVELOPMENT IMPACT: **This request meets the following goals and objectives of the Bloomington Comprehensive Plan 2035**: N/A

Respectfully submitted for consideration.

Prepared by: Joshua Moreland, Support Staff V

ATTACHMENTS:
FIN 1B Council Finance Summary Report

CITY OF BLOOMINGTON FINANCE REPORT

PAYROLL

Date	Gross Pay	Employer Contribution	Totals
9/23/2022	$ 2,220,759.27	$ 557,051.85	$ 2,777,811.12
9/23/22 - 9/28/22	$ 99,780.69	$ 1,363.70	$ 101,144.39
Off Cycle Adjustments			
		PAYROLL TOTAL	**$ 2,878,955.51**

ACCOUNTS PAYABLE (WIRES)

Date	Bank	Total
10/10/2022	AP General	$ 4,135,633.76
	AP JMScott	
10/10/2022	AP Comm Devel	$ 25,081.82
10/10/2022	AP IHDA	$ 20,240.00
10/10/2022	AP Library	$ 34,766.63
	AP MFT	
9/22/22 - 9/29/22	Out of Cycle	$ 94,814.85
9/2/22 - 9/25/22	AP Bank Transfers	$ 147,206.89
	AP TOTAL	**$ 4,457,743.95**

PCARDS

Date Range	
8/2/22 - 9/1/22	$118,639.15
PCARD TOTAL	**$ 118,639.15**

GRAND TOTAL **$ 7,455,338.61**

Respectfully,

F Scott Rathbun
Director of Finance

CONSENT AGENDA ITEM NO. 7.B

FOR COUNCIL: October 10, 2022

WARD IMPACTED: City-Wide Impact

SUBJECT: Consideration and action to approve an Intergovernmental Agreement between the City of Bloomington and Bloomington Public Schools, District 87, so that they can purchase rock salt from the City during winter 2022-2023, in the amount of the cost per ton the City paid for the rock salt plus a storage and handling, and loading fee of $5.00 per ton, not to exceed 250 tons per fiscal year, with automatic renewals through April 30, 2028, as requested by the Public Works Department.

RECOMMENDED MOTION: The proposed Intergovernmental Agreement be approved.

STRATEGIC PLAN LINK:
Goal 1. Financially Sound City Providing Quality Basic Services

STRATEGIC PLAN SIGNIFICANCE:
Objective 1e. Partnering with others for the most cost-effective service delivery

BACKGROUND: In an effort to assist District 87 with their snow operations, staff has negotiated the referenced agreement. The amount of salt purchased by the District should not affect the snow operations for the City.

If approved, this agreement shall be effective as of the date it is passed by the final party to do so and conclude on April 30, 2023. This agreement will be automatically renewed for up to five periods of one year each unless either party gives (90) days written notice to the other prior to the expiration date of the original term or any renewal period. Renewals will be reviewed by the Public Works Director before the end of each term for acceptable performance.

COMMUNITY GROUPS/INTERESTED PERSONS CONTACTED: Bloomington Public Schools, District 87.

FINANCIAL IMPACT: The salt used from the City's supply will be paid by District 87 at a cost that is determined by the cost per ton the City paid for the rock salt plus a storage, handling, and loading fee of $5.00 per ton. The maximum amount the district may purchase will be 250 tons per fiscal year. Proceeds will be applied to Snow & Ice Removal-Other Miscellaneous Revenue account (10016124-57990). Stakeholders can locate this in the FY 2023 Budget Book titled "Budget Overview & General Fund on page 297.

AMERICAN RESCUE PLAN FUNDING IMPACT: N/A

COMMUNITY DEVELOPMENT IMPACT: **This request meets the following goals and**

objectives of the Bloomington Comprehensive Plan 2035: Goal EDU-1. Increased coordination between the City and the school district to maintain high quality educational opportunities equitably for all students within the City, Objective EDU-1.2. The City will partner with District 87 to revitalize the established neighborhoods in the core of the City.

Respectfully submitted for consideration.

Prepared by: Colleen Winterland, Superintendent of Streets and Sewers

ATTACHMENTS:
PW 1B District 87 Salt Agreement

INTERGOVERNMENTAL AGREEMENT
BETWEEN THE CITY OF BLOOMINGTON AND
BLOOMINGTON PUBLIC SCHOOLS, DISTRICT 87

In order to better conserve taxpayer dollars, the City of Bloomington (hereafter "City") and Bloomington Public Schools, District 87 (hereafter "District 87") hereby enter into the following agreement for rock salt from the date of its execution through April 30, 2023, with automatic renewals through April 30, 2028.

SECTION 1. The City stores and loads rock salt from its 502 South East Street salt storage facility. District 87 will provide the transportation from this salt storage facility.

SECTION 2. The City of Bloomington would prefer, but does not require, that the total salt distribution be taken by District 87 at one time. Loading of the salt will need to be arranged by District 87 with the City a minimum of forty-eight (48) hours prior to the date of request. The City reserves the right to deny the timeline of pickup given based upon daily operations of the City.

SECTION 3. The salt used from the City's supply will be paid by District 87 at a cost that is determined by the cost per ton the City paid for the rock salt plus a storage, handling, and loading fee of five dollars ($5.00) per ton.

SECTION 4. The amount of salt provided to District 87 shall not exceed two hundred fifty (250) tons per City fiscal year, which is from May 1 to April 30 of the following year.

SECTION 5. This agreement shall be effective as of the date it is passed by the final party to do so and conclude on April 30, 2023. This agreement will be automatically renewed for up to five (5) periods of one (1) year each unless either party gives ninety (90) days written notice to the other prior to the expiration date of the original term or any renewal period. Renewals will be reviewed by the Public Works Director before the end of each term for acceptable performance.

PASSED this 17th day of August 2022.

APPROVED this _____ day of _____ 2022.

CITY OF BLOOMINGTON

_____
Mboka Mwilambwe, Mayor

ATTEST

_____
Leslie Smith-Yocum, City Clerk

BLOOMINGTON PUBLIC SCHOOL, DISTRICT 87

[redacted]
Mark Wylie, Board President

8/17/2022
Dated

CONSENT AGENDA ITEM NO. 7.C

FOR COUNCIL: October 10, 2022

WARD IMPACTED: City-Wide Impact

SUBJECT: Consideration and action to approve an Agreement with T2 Systems Inc., for three years, to provide hosting services for the City's T2 Flex Parking Management System for the first-year cost of $40,199.63, second-year cost of $42,209.61, and third-year cost of $44,320.11, for a total cost of $126,729.35, as requested by the Information Technology Department and the Public Works Department.

RECOMMENDED MOTION: The proposed Agreement be approved.

STRATEGIC PLAN LINK:
Goal 1. Financially Sound City Providing Quality Basic Services

STRATEGIC PLAN SIGNIFICANCE:
Objective 1d. City services delivered in the most cost-effective, efficient manner

BACKGROUND: In 2004, the City implemented the T2 Software System to administer the parking violations issued by the parking attendants and the Police Department. The implementation was highly successful. The City implemented multiple features such as handheld ticket writers, scheduled invoice printing, and automatic license plate retrieval with the State of Illinois.

The T2 Flex cloud-based software system is used by the City Facilities department to manage and streamline daily operations of parking space rental and parking violations. The system provides daily management of the parking decks, the daily parking enforcement tool used by the City's enforcement officers in the field, and an online ecommerce solution to allow citizens to pay fees online. As such, it is a critical component of achieving the high level of customer service for which the City strives. T2 Systems, Inc. is the sole developer and provider of the T2 Flex parking management software solutions, and the hosting agreement for the T2 Flex parking management solution is sold solely through T2 Systems, Inc., of Indianapolis, IN. No third-party vendor is able to provide maintenance and support.

COMMUNITY GROUPS/INTERESTED PERSONS CONTACTED: N/A

FINANCIAL IMPACT: Funds are included in the FY 2023 Budget under the Information Technology- Repair/Maintenance Office & Computer Equipment Account (10011610-70530). Stakeholders can locate this in the FY 2023 Budget Book titled "Budget Overview & General Fund" on page 164. Year two and three of this contract will be budgeted in each of the respective future fiscal years.

AMERICAN RESCUE PLAN FUNDING IMPACT: N/A

COMMUNITY DEVELOPMENT IMPACT: **This request meets the following goals and objectives of the Bloomington Comprehensive Plan 2035**: N/A

Respectfully submitted for consideration.

Prepared by: Megan Horath, Administrative Assistant

ATTACHMENTS:
IT 1B Quote
IT 1C T2 Systems LSJF
IT 1D Original Software Subscription Agreement with T2

T2 Systems - Quotation

For: City of Bloomington IL
Quote ID: Q-26091
Date Issued: 7/1/2022
Expires: 11/25/2022

Bill To:
City of Bloomington IL
P O Box 3157
Bloomington, Illinois 61702
United States

Prepared By:
Darlene Hay

Prepared For:
Megan Horath

Ship To:
City of Bloomington
115 E. Washington Street
Bloomington, IL 61701
United States

Russ Waller
309-434-2492
rwaller@cityblm.org
EIN: 20-1925629

Subscriptions

Product Name	Product Code	Quantity	Sales Price	Total
Core Flex Professional Edition				
Year 1	100.2053	5.00	USD 5,242.72	USD 26,213.60
Term: 11/30/22 - 11/29 /23				
Year 2	100.2053	5.00	USD 5,504.86	USD 27,524.30
Term: 11/30/23 - 11/29/ 24				
Year 3	100.2053	5.00	USD 5,780.10	USD 28,900.50
Term: 11/30/24 - 11/29/25				
Flex Mobile Enforcement				
Year 1	100.2051	4.00	USD 1,055.32	USD 4,221.28
Term: 11/30/22 - 11/29 /23				
Year 2	100.2051	4.00	USD 1,108.09	USD 4,432.36
Term: 11/30/23 - 11/29/ 24				
Year 3	100.2051	4.00	USD 1,163.49	USD 4,653.96
Term: 11/30/24 - 11/29/25				
FlexPort Accounts				
Year 1	100.2226	5.00	USD 578.92	USD 2,894.60
Term: 11/30/22 - 11/29 /23				
Year 2	100.2226	5.00	USD 607.86	USD 3,039.30
Term: 11/30/23 - 11/29/ 24				
Year 3	100.2226	5.00	USD 638.26	USD 3,191.30
Term: 11/30/24 - 11/29/25				
FlexPort Enforcement				

Year 1	100.2227	5.00	USD 1,374.03	USD 6,870.15
Term: 11/30/22 - 11/29 /23				
Year 2	100.2227	5.00	USD 1,442.73	USD 7,213.65
Term: 11/30/23 - 11/29/ 24				
Year 3	100.2227	5.00	USD 1,514.87	USD 7,574.35
Term: 11/30/24 - 11/29/25				

Year 1 Total: USD 40,199.63
Year 2 Total: USD 42,209.61
Year 3 Total: USD 44,320.11

Net Total: USD 126,729.35

Tax Amount: included upon invoicing, if applicable
Tax Comments: N/A

Billing Terms

This renewal quote is for expiring subscriptions and may not include all subscription services in use by your organization. Any italicized pricing on the quote indicates a continuation of a current subscription, following a bridge term. The italicized pricing is a place holder, included on the quote only to note a change in a subscription's term. The quote's annual totals do **NOT** include the cost of any italicized pricing because these amounts are not being renewed.

Ongoing software subscriptions and hosting fees are billed annually and payable on the anniversary of the software location activation date. Subscriptions and support shall be automatically renewed for an additional term of one year, effective immediately after the expiration of any then-current term, unless either T2 or Subscriber gives notice of non-renewal to the other at least sixty days in advance of the expiration of the then-current term.

Tax rate, if applicable, will be finalized for calculation at time of invoicing. Invoices paid via credit card will incur a 2.5% convenience fee.

Is a PO (purchase order) number required to be referenced on the invoice? Purchase orders can be forwarded to purchaseorders@t2systems.com

☒ YES

☐ NO

Quote Number: Q-26091
PO Required?

IF "NO" IS SELECTED UNDER PO REQUIRED, CUSTOMER ACCEPTS RESPONSIBILITY TO PROCESS CONTRACT PAYMENT WITHOUT RECEIPT OF PURCHASE ORDER NUMBER.

Customer City of Bloomington, IL

Signature

Print Name Tim Gleason

Title City Manager

Date

PO #

LIMITED SOURCE JUSTIFICATION

(Requester completes Section A & B)

SECTION A –LIMITED SOURCE PURCHASE:

Complete if a purchase is $5,000 or over and due to reasons of previous capital investment, improved public service, long-term operational need, security, patents, copyrights, critical need for responsiveness, proximity, Federal, State, or other regulations, necessary replacement parts and/or compatibility, warranty, this procurement justifies a limited source exemption.

Vendor Name & #: 1027 T2 Systems, Inc.	**Amount:** $ 126,729.35	**Date:** 9/21/2022

Description of item/services:

T2 parking system software maintenance agreement

Justification:

The City uses T2 Systems, Inc to manage the parking desk monthly parking passes and parking attendants' citation programs. This software has been in place since 2002. T2 Systems, Inc. is a sole developer and provider of the T2 Flex parking management software solutions. No third party is able to provide maintenance and support, has the development rights as would be assigned by T2 Systems, Inc., or the access to the sole source code for the T2 Flex solutions, as this is the exclusive property of T2 Systems, Inc. THE CITY HAS MADE A CAPITAL INVESTMENT WITH THIS SOFTWARE/PROGRAM AND IT WOULD BE COSTLY TO BRING ON A NEW VENDOR/PROGRAM. A NEW SYSTEM WOULD ALSO REQUIRE TRAINING AND INFORMATION SERVICES RESOURCES TO TRANSITION.

SECTION B - REQUESTER CERTIFICATION: By submitting this request, I attest that the above justification/information is accurate and complete to the best of my knowledge and that I have no personal or business interests relative to this request.

Craig McBeath — 9/21/2022 | 9:58 AM CDT

(Name & Signature of Department Director or Designee ***Approving***) — **Date**

SECTION C –TO BE COMPLETED BY THE PROCUREMENT OFFICE:

Based on the information provided in Section A and attached supporting documents,

I concur ☒ / do not concur ☐ (see below) with the purchase to be a Limited Source.

Do not concur for the following reason(s):

Click or tap here to enter text.

Carla Murillo — Carla Murillo — 9/21/2022 | 10:07 AM CDT

(Name & Signature of Purchasing Agent or Designee) — Date

T2 SYSTEMS, INC.

SOFTWARE SUBSCRIPTION AGREEMENT

THIS SOFTWARE SUBSCRIPTION AGREEMENT is entered into as of November 30, 2012 ("**Effective Date**") and contains the subscription agreement between City of Bloomington, Illinois ("**Subscriber**") and T2 SYSTEMS, INC. ("**T2**"). Subscriber specific details are contained in the ***Quote*** executed by the Parties. Certain terms are defined in Article 13.

Article 1. SOFTWARE SUBSCRIPTION

Section 1.1 **Software Subscription.** T2 grants to Subscriber a non-exclusive right to use: (i) one Production Copy of the T2 Flex® Software for its Authorized Concurrent Users and (ii) copies of the handheld ticket-writer software equal to the number of handheld ticket-writer Hardware units purchased by Subscriber, if applicable. T2 grants the Subscription(s) for the Authorized Purposes and no other purposes. At no time may the number of user accounts for the Software exceed the number of Authorized Concurrent Users. T2 has the right to monitor number of Concurrent Users. Subscriber may increase the number of Authorized Concurrent Users in the manner provided for in the ***Quote.***

Section 1.2 **Term.** The Subscriptions granted in this Article 1 and Article 4 are for the term specified in Section 7.1.

Section 1.3 **Warranty of Functionality.** T2 warrants to Subscriber that:

> For a period of ninety (90) days after T2 installs the T2 Flex® Software, including the handheld ticket-writer Software if applicable, at the Subscriber's premise or installs it on the Hosted System, whichever the case may be, the Software will provide at least the functionality contained in the then-current product literature as posted on T2's corporate website, and will perform without errors which would significantly affect its ability to provide that functionality. This warranty is contingent upon Subscriber advising T2 of any failure of the T2 Flex® Software to perform within ninety (90) days after the Installation Date. The notice to T2 shall specifically identify the error or errors. T2's services in connection with the correction of the errors shall be provided without charge to Subscriber. T2 does not warrant that the operation of the T2 Flex® Software will be uninterrupted or error free. Further, T2 does not warrant that the T2 Flex® Software will operate on any particular configuration of software, operating system or computer system.

Section 1.4 **No Other Warranties.** The warranties made by T2 in Section 1.3 with regard to both the T2 Flex ® Software and the handheld ticket-writer Software are in lieu of all other representations or warranties, express or implied, including without limitation any implied warranties of design, merchantability, or fitness for any specific or general purpose and those arising by statute or by law, or from a course of dealing, or usage of trade, all of which are disclaimed.

Section 1.5 **Installation.** Except as provided in Section 3.2, T2 shall install the Software and confirm that the Software is working properly. Once the Software is installed, the Subscriber shall verify that the installation is complete and the Software is working properly.

Article 2. HARDWARE

Section 2.1 **Applicability.** The provisions of this Article 2 apply only if ***Quote*** states that T2 or an authorized T2 Systems distributor will sell hardware (the "**Hardware**") and related software. In addition, the provisions of Article 2 only apply to Hardware purchased through T2 or an authorized T2 Systems distributor. Any Hardware purchased from sources outside of T2 will be the sole responsibility of the Subscriber. T2 will not be responsible for the failure of the software to perform to the extent that such failure to perform is due to the failure of a third party function, such as Internet availability required for the connection between the Hardware and Flex or the wireless network availability required for the T2 Software to be able to send and receive data. In no event shall T2 be liable for the failure of the software to perform if such failure arises due to the combination of the software with third party hardware or software. T2 shall not cover repair, labor or replacement of parts that are by nature expendable.

Section 2.2 **Handheld Hardware Warranty.** T2 warrants to the Subscriber that the Handheld Hardware will be free from defects in workmanship and materials, under normal use, for one year (365) days from the date the Hardware is delivered.

Section 2.3 **Access Revenue Control Hardware Warranty.** T2 Systems warrants that all hardware sold will be free from any defects in material and workmanship for the warranty periods described below under normal operating conditions when installed in accordance with the T2 Systems installation instructions, normal wear and tear excepted.

The warranty periods for the following products are:

(i) Vehicle Gates: 2 years or 1 million cycles. (Whichever comes first)

(ii) Revenue equipment (including firmware): 1 year

(iii) Loop Detectors: 1 year

The warranty period shall start from the date of installation of the product by certified installation personnel. If a project requires a delayed warranty start date, the distributor or customer must request a delayed start date in writing five business days before the scheduled installation date. T2 Systems will review and accept on a case by case basis. No distributor shall have the authority to bind T2 Systems to any warranty beyond that extended therein.

Section 2.4 **Exclusive Remedy.** Should a Hardware Error occur during the warranty period and you notify T2, Subscriber's sole and exclusive remedy shall be, at T2's sole option and expense, to repair or replace the Hardware parts which have been found to be defective. At T2's sole discretion, parts may be repaired as opposed to being replaced. T2 may

replace parts with others of like kind and quality. T2 will provide service at any T2 service center or at such other location as may be designated by T2. Subscriber agrees to follow the Return Materials Authorization Process as set forth in **Error! Reference source not found.**~~Section 2.8~~.

Section 2.5 **Hardware Repair Limitations.** T2's liability for Hardware repairs under this Agreement shall be limited to the actual cash value of the Hardware in operating condition at the time of the claim. Except as otherwise expressly agreed by T2, nothing herein shall obligate T2 to repair or replace aesthetic or structural items including, but not limited to, damage to the case or screen from dropping, warping of any kind to housing, case or frame of the Hardware. Subscriber agrees that it is responsible for repair costs associated with worn out or damaged touch screens or LCD modules. This Agreement only applies to the operation of the Hardware under the conditions for which it was designed, and does not cover damage resulting from external causes such as, but not limited to, damage resulting from a collision with any object or from fire, flooding, sand, dirt, windstorm, hail, earthquake, act of God, damage from exposure to weather conditions not anticipated or contemplated by the manufacturer's specifications, battery leakage, theft, misuse, abuse, damage from failure of, or improper use of, any electrical sources or connection to other products not recommended for interconnection by the Hardware manufacturer. Subscriber shall perform all preventative maintenance recommended by the Hardware manufacturer to maintain the Hardware in operating condition and Subscriber agrees that any loss or damage resulting from the failure to provide the Hardware manufacturer's recommended maintenance is not covered by this Agreement.

Section 2.6 **Obsolete Hardware.** While it is T2's intention to support Hardware for as long as is technically and financially feasible, T2 reserves the right to discontinue maintenance and support of obsolete Hardware six months after providing written notice to Subscriber. After that time, T2 will offer repair services on the then-current standard rates for time and materials for the obsolete Hardware so long as parts and labor are reasonably available.

Section 2.7 **Engineering Modifications.** All products of T2 Systems are subject to design and/or appearance modifications which are production standards at the time of shipment. T2 Systems may, but shall not be required, to, modify, or update products shipped prior to a current production standard.

Section 2.8 **Return Materials Authorization (RMA) Process.** In the event that Subscriber experiences a malfunction with respect to the Hardware, Subscriber shall call T2 technical support in order to determine the cause of the malfunction. If T2 technical support determines that the Hardware does require service, the technician will instruct Subscriber as to the proper return procedure. A Return Material Authorization Number (RMA) must be obtained before product is returned. Subscriber shall return the damaged Hardware, together with a description of the malfunction, to T2 or other service location as directed by the T2 technician. Subscriber shall remove the Flash ROM or RAM cards prior to shipping the Handheld Hardware to the appropriate T2 service center. Subscriber is responsible for all freight and insurance charges inbound to the service center. T2 is responsible for all freight and insurance charges outbound from the service center. T2 Systems is not responsible for removal, installation, or any incidental expenses incurred in replacing the defective item or shipping the product to or from the distributor or customer.

Section 2.9 **Restocking Fee for Returned Hardware.** The Subscriber may return handheld and T2 Point of Sale hardware within 30 days of delivery if the

goods are in an unsoiled, undamaged, new, and re-saleable condition. The Subscriber may cancel access and revenue control hardware within three (3) weeks of T2 receiving a purchase order. T2 charges a minimum of 25% restocking fee on all equipment that is returned unless the delivered goods were damaged or found malfunctioning upon arrival by purchaser. The credit will be issued only after the equipment is inspected and determined by an Employee of T2 to be in unsoiled, undamaged, new and re-saleable condition. The Subscriber will pay for all freight charges to T2's plant unless the delivered goods were damaged or found malfunctioning upon arrival, in which case the seller shall pay all return freight charges. Subscriber and/or the Distributor agree to inspect all delivered pieces of ARC hardware immediately and report any visible damage within 48 hours to T2. Failure to report damage in this time frame will result in the inability to replace damaged goods. Hidden damage (i.e. electrical issues, board malfunctions, etc.) must be reported within 7 days.

Section 2.10 **Limitation of Liability.** THE WARRANTIES AND REMEDIES SET FORTH IN THIS Article 2 ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, TERMS OR CONDITIONS, EXPRESS, IMPLIED OR STATUTORY, INCLUDING WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, ACCURACY, CORRESPONDENCE WITH DESCRIPTION, SATISFACTORY QUALITY AND NON-INFRINGEMENT, ALL OF WHICH ARE EXPRESSLY DISCLAIMED BY T2. T2 SHALL NOT BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, INDIRECT, SPECIAL, OR PUNITIVE DAMAGES OF ANY KIND, LOSS OF INFORMATION OR DATA, LOSS OF REVENUE, LOSS OF BUSINESS OR OTHER FINANCIAL LOSS ARISING OUT OF OR IN CONNECTION WITH THE SALE OR USE OF THE HARDWARE, WHETHER BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT PRODUCT LIABILITY OR ANY OTHER THEORY, EVEN IF T2 HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES AND EVEN IF ANY LIMITED REMEDY SPECIFIED IN THIS SUBSCRIPTION AGREEMENT IS DEEMED TO HAVE FAILED OF ITS ESSENTIAL PURPOSE. T2'S ENTIRE LIABILITY SHALL BE LIMITED TO REPLACEMENT, REPAIR, OR REFUND OF THE PURCHASE PRICE PAID, AT T2'S OPTION.

Article 3. HOSTING SERVICES

Section 3.1 **Applicability.** The provisions of this Article 3 apply only if ***Quote*** states that T2 will provide hosting services ("**Hosting Services**").

Section 3.2 **Software Installation.** T2 shall install the Software on the Hosting System.

Section 3.3 **Access.** In consideration of the payment of the Hosting Fee, T2 will provide Subscriber access to the Software via the Hosting Services and Hosting System. Subscriber may access the Hosting System using Subscriber's remote access equipment. T2 shall undertake commercially reasonable efforts to provide Subscriber with consistent service in a shared hardware environment (i) insulated from changes in the Internet, and (ii) sufficient to access the Software on T2 Application Server through the Internet twenty-four (24) hours per day, seven (7) days per week, except for routine maintenance performed pursuant to notice to

Subscriber. T2 shall monitor T2's Application Server and undertake commercially reasonable efforts to restore promptly all failures of service at no additional charge to Subscriber. Subscriber shall be solely responsible for (i) providing Internet devices and supported browsers, and (ii) Internet connections, at Subscriber's sole cost and expense.

Section 3.4 **Hours of Operation.** Generally, connectivity will be available seven (7) days per week, twenty-four (24) hours per day. Subscriber's access is subject to outages for scheduled maintenance activities and outages attributable to failure of the Subscriber's telecommunications provider to provide an Internet connection. Whenever practical, scheduled maintenance activities will be performed [*outside*] the hours of 8:00 a.m. and 8:00 p.m ET. Notice of scheduled maintenance shall be provided to Subscriber via email.

Section 3.5 **Maintenance and Updates.** T2 shall provide maintenance for the Hosting System, including updates and patches and shall install any updates or enhancements for the Software that are released by T2 to its Subscribers. T2 will notify Subscriber when the updated version is available.

Section 3.6 **Improvements.** In order to maintain the quality of the Hosting Services provided by T2 hereunder, T2 reserves the right to change the hours of operation and other facilities and procedures relating to access and use of its Hosting Services. T2 will provide Subscriber with ten (10) days notice prior to any planned improvements that may materially affect the Hosting Services.

Section 3.7 **Passwords and Security.** Subscriber will control the issuance of passwords and user IDs for the use of the Software by Subscriber's Authorized Concurrent Users. Subscriber shall be responsible for the confidentiality of all those passwords. Subscriber acknowledges that it will be responsible for all liabilities incurred through use of any password assigned to Subscriber, and that any transactions under Subscriber's password will be deemed to have been performed by Subscriber.

Section 3.8 **Ownership of Data.** Subscriber shall maintain ownership of any Subscriber Data provided to T2 or input to the Software pursuant to this Agreement. T2 shall not supplement, modify or alter any Subscriber Data except as directed or requested by Subscriber (other than technical modifications necessary to upload/format the Subscriber Data to the Web Site).

Section 3.9 **Limitation of Liability.** T2's total liability, if any, with respect to the subject matter of the Hosting Services (including, but not limited to, liability arising out of contract, tort, strict liability, breach of warranty or otherwise), is limited to the fees paid by Subscriber for the Hosting Services in the three (3) months prior to the act that gave rise to the liability; *provided, however*, that this limitation does not apply to damages to Subscriber directly caused by willful or malicious misconduct by T2 or its employees or by any claims brought against Subscriber based upon a violation of third party rights by the Software, which are covered by Section 10.4. T2 WILL NOT BE LIABLE IN ANY EVENT FOR LOSS OR INACCURACY OF DATA, LOSS OF PROFITS OR REVENUE, OR INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, THE COST OF ANY SUBSTITUTE SERVICE), WHETHER OR NOT FORESEEABLE AND EVEN IF T2 HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THIS SECTION SHALL APPLY TO ANY ACTION OR ARBITRATION HEREUNDER.

Section 3.10 **Warranties.** EXCEPT AS MAY BE OTHERWISE SPECIFICALLY SET FORTH IN THE QUOTE, T2 MAKES NO REPRESENTATIONS OR WARRANTIES CONCERNING THE HOSTING SERVICES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Section 3.11 **Performance.** ALTHOUGH T2 WILL TAKE REASONABLE STEPS TO PROVIDE ERROR-FREE AND CONTINUOUS HOSTING SERVICES, T2 DOES NOT REPRESENT, WARRANT OR GUARANTEE THAT THE HOSTING SERVICES WILL BE UNINTERRUPTED OR ERROR-FREE. AS A RESULT, THE HOSTING SERVICES ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND.

Article 4. PROFESSIONAL SERVICES.

Section 4.1 **Applicability.** The provisions of this Article 4 apply only if the ***Quote*** states that T2 will provide web site development services or other custom development services (collectively, the "**Professional Services**").

Section 4.2 **Web Site.** T2 shall provide a Web Site for Subscriber. T2 and Subscriber contemplate that the Web Site will be enhanced over time and unless T2 is providing Hosting Services, the Web Site will be hosted by Subscriber.

Section 4.3 **License.** Subject to payment by Subscriber of any Web Site Fee which is due, T2 grants to Subscriber a non-exclusive right to use the Web Site prototype and any additional enhancements or customization in connection with the use of the Software under the same Terms and Conditions.

Section 4.4 **Web Site Development.** If the Subscriber determines that the Web Site requires additional enhancements or customization, T2 shall provide development services relating to the Web Site. T2's services in assisting Subscriber in this regard shall be provided on a Time and Materials Basis.

Article 5. TECHNICAL SUPPORT

Section 5.1 **Technical Support Services.** T2 offers the Subscriber technical supportas described in Section 13.9.

Section 5.2 **Technical Support Hours.** T2 offers Technical Support from 8:00 a.m. EST to 8:00 p.m. EST Monday through Friday excluding holidays. The Target Response Time is two (2) hours.

Section 5.3 **Updates and Enhancements.** To the extent that T2 releases an updated or enhanced version of the Software during the Subscription Term, T2 will make the updated version available for download by Subscriber at no additional charge. Subscriber shall be permitted to use the updates and enhancements to the extent provided in Article 1.

Section 5.4 **Technical Support Exclusions.** T2 will not be responsible for failure to correct a problem to the extent that T2 is unable to replicate the

problem, or if the problem is caused by: (i) misuse of the Software, (ii) failure by Subscriber to utilize compatible computer and networking hardware and software, (iii) interaction with software or firmware not provided by T2, (iv) any change in applicable operating system software, or(v) the failure of Subscriber to install updates to the Software provided by T2. A Subscriber who is not current with their account will not be eligible for technical support. In any such event, T2 will advise Subscriber and, upon request, will provide such assistance as Subscriber may reasonably request with respect to such problem at T2's then-current standard rates for time and materials.

Section 5.5 **Cooperation.** Subscriber acknowledges (i) that certain services or obligations of T2 hereunder may be dependent on Subscriber providing certain data, information, assistance, or access to Subscriber's systems, (collectively, "**Cooperation**"), and (ii) that Cooperation may be essential to the performance of such services by T2. The parties agree that any delay or failure by T2 to provide services hereunder which is caused by Subscriber's failure to provide timely Cooperation reasonably requested by T2 shall not be deemed to be a breach of T2's performance obligations under this Agreement.

Section 5.6 **Supported Versions of Flex.** T2 requires all T2 Flex instances hosted by the Subscriber or hosted by T2 on behalf of Subscriber for either production or for testing to be the current or next most recently released T2 Flex application software version. T2 reserves the right to upgrade any T2 hosted T2 Flex instance with 24 hour notice to the Subscriber. Notice may be provided via email or phone.

Article 6. PAYMENT

Section 6.1 **Fees.** The Subscription Fee, Web Development/eBusiness, Hosting Services Fee, Professional Services Fee, Hardware Fee and any additional agreed upon fees (collectively, the "**Fees**") shall be payable according to the terms set forth in the ***Quote***. Partial periods shall be prorated. Notwithstanding anything to the contrary contained herein, if this Agreement is terminated by T2 for cause or by Subscriber for convenience prior to the expiration of the Guaranteed Minimum Commitment (as set forth in the ***Quote***), the unpaid balance for the Guaranteed Minimum Commitment shall accelerate and be due and payable in full immediately upon acceleration.

Section 6.2 **Change in Fees.** T2 will increase the Fees by five (5) percent per year, provided T2 notifies Subscriber in writing at least sixty (60) days prior to a renewal period. If T2 fails to provide a sixty (60) day notice, then the increase in fees will not become effective until the beginning of the first month following the sixty (60) day period after T2 notified Subscriber of the increase.

Section 6.3 **Certain Taxes.** If applicable, in addition to the consideration provided herein, Subscriber agrees to pay amounts equal to any sales, use, excise or other taxes or any custom duties levied against or imposed: (i) upon the subscription of the Software to Subscriber, or (ii) upon the Authorized Production Copies and the permitted back-up copies used by Subscriber, or (iii) upon the support provided under Article 5, or (iv) resulting from this Agreement, or any activities hereunder; but Subscriber shall not be obligated to pay any taxes based on T2's net income. If Subscriber claims an exemption from any such taxes, Subscriber shall provide to T2 an appropriate exemption certificate. If Subscriber challenges the applicability of any tax, Subscriber shall nevertheless pay the same to T2 and Subscriber may thereafter challenge the tax and seek a refund thereof. Subscriber agrees to indemnify and hold

harmless T2 from any cost, fee, penalty or expense (including counsel fees) in connection with any assertion by any taxing authority that T2 has failed to collect and remit their sales or use tax on transactions hereunder or to pay any property taxes on the copies of the Software in Subscriber's possession but shall have no such obligation to T2 with respect to any amount paid by Subscriber to T2 and not remitted to the relevant taxing authority.

Section 6.4 **Invoices.** Invoices for payment of amounts due to T2 under this Agreement shall be itemized in reasonable detail. If Subscriber does not dispute any part of an invoice, Subscriber shall pay the amounts due within thirty (30) days of receipt. If Subscriber disputes one or more items of an invoice, Subscriber shall: (i) pay T2 within thirty (30) days of receipt of the invoice the amounts for items not disputed; and (ii) notify the Finance Department of T2 within those thirty (30) days in writing of its dispute of one or more items of the invoice, identifying the item or items in dispute and setting forth in reasonable detail the basis for each dispute. Failure to so notify the Finance Department of T2 of each item in dispute and the basis therefore shall be deemed acceptance of those items, and Subscriber shall forthwith pay T2 therefore.

Section 6.5 **Failure to Make Payment.** If Subscriber fails to make any payments within thirty (30) days after the amount is due pursuant to this Agreement, then the amount, without the necessity of any notice or action by T2 shall become due and payable together with interest thereon from the date of nonpayment at twelve percent (12%) per annum [or the highest rate permitted by law if less than twelve percent (12%)] and with reasonable attorneys' fees and other costs of collection. The non-exclusive subscription granted pursuant to Article 1 of this Agreement may be terminated by T2 with thirty (30) days prior written notice in the event Subscriber fails to make any payments when due under this Agreement.

Section 6.6 **Payment by Automated Clearing House.** If applicable, Subscriber agrees that the Subscription Fee and Web Site Fee (if applicable) shall be paid by Automated Clearing House debit. Subscriber agrees to complete the ACH Authorization Agreement accompanying this Software Subscription Agreement. If Subscriber is unable to execute an ACH Authorization Agreement, Subscriber shall make payment to T2 by check, credit card or debit card in the amount payable hereunder. Furthermore, Subscriber agrees to submit such payment to T2 so that payment is received by T2 on or before the Subscription Fee due date.

Payment Options

1. Annual Subscription paid in advance

2. Monthly Subscription paid in advance. Monthly payments are subject to a 3% processing fee.

3. ACH (see above)

Section 6.7 **Late Charges.** If Subscriber does not make timely payment of the Subscription Fee to T2 of any amount payable hereunder, in addition to the remedies available to T2 at law or equity, T2 may collect interest on the sum then owing at the rate of 12% per month from the due date until payment by Subscriber; provided, however, that in no event shall the aggregate interest charges exceed the maximum rate of interest which could be charged under applicable law and T2 may suspend services until all amounts due are collected. If

payment is not received within thirty (30) consecutive days, T2 has the right to suspend services provided hereunder.

Article 7. TERM AND TERMINATION

Section 7.1 **Term.** The term of the Subscriptions granted in Article 1 and the provision of support under Article 5 shall commence on the Installation Date or three (3) months from the Effective Date of the Software Subscription Agreement, whichever is earlier, and shall continue for the period set forth in the ***Quote*** (**"Initial Term"**). If the Subscriber delays installation beyond the timeline in the ***Quote***, the Subscriber may incur additional installation fees. If a delay in installation is caused by T2, the initial term of this Agreement shall commence at the date the Software is installed and the Subscriber executes the installation verification acknowledgement. Except as may be otherwise provided in the ***Quote***, the term of the Subscriptions and support shall be automatically renewed for an additional term of one (1) year effective immediately after the expiration of any then-current term, unless either T2 or Subscriber gives notice of non-renewal to the other at least sixty (60) days in advance of the expiration of the then-current term.

Section 7.2 **Reengagement** When a project does not stay on the agreed upon schedule as defined in a mutually agreed upon Project Plan because the Subscriber did not meet their deliverables, or if the Subscriber requests a new date after a committed date has been scheduled, the Subscriber will be responsible for:

a) Acceleration of payment for all Professional Services completed to date (i.e., I&T, project management costs, eBiz, interfaces, etc.).

b) All hard costs, including travel.

c) Rebooking fees.

d) Any necessary rework (repeat of training, additional data sample, additional PM hours) would be billed at restart.

e) A reengagement fee of 20% of the total professional services plus travel expenses associated with the reengagement.

Section 7.3 **Termination.** Subscriber may terminate the Subscriptions granted in this Agreement, any support under Article 5, any Professional Services, and any Hosting Services by notice of non-renewal given in accordance with Section 7.1 or by notice given in accordance with the provisions of Article 11. T2 may terminate the Subscriptions granted in the Agreement and any support under Article 5 by notice of non-renewal given in accordance with Section 7.1, by termination as provided in Section 6.5 or upon fifteen (15) days prior written notice in the event Subscriber uses the Software in a manner not permitted under the Agreement. Nothing in this agreement or any other agreement between the parties shall prohibit T2 from contracting with, or providing goods (including software) or services to, any other party to service the same end users contemplated by this agreement.

Section 7.4 **Return of Materials.** Upon termination of the Subscription of the Software or Handheld Software for any reason, Subscriber shall destroy all

copies of the Software or Handheld Software and any other materials received from T2 and furnish T2 a written statement certifying that through Subscriber's best efforts, and to the best of Subscriber's knowledge, all copies of the Software or the Handheld Software, including all copies of Client Components, and any other materials received from T2, have been destroyed.

Section 7.5 **Return of Subscriber Data..**

Upon termination of the Subscription of the Software, T2 shall, at Subscriber's request, return Subscriber's data in an Oracle standard database export format. To accommodate special requests to receive data in any other format, Subscriber will be responsible for additional time and materials required to accommodate this request. All special requests will be scoped by T2 and then an initial estimate provided to the Subscriber.

Section 7.6 **Outstanding and Future Payment Obligations.** All payment obligations between the parties that are outstanding as of the effective date of termination, or which accrue hereunder prior to the effective date of termination or which accrue for services that are completed after the effective date of termination shall survive the termination of this Agreement.

Article 8. SUBSCRIBER DATA

Section 8.1 **Confidential Treatment.** All Subscriber Data which is submitted by Subscriber to T2 pursuant to this Agreement will be safeguarded by T2 to the same extent that T2 safeguards data relating to its own business; *provided, however*, if Subscriber Data is publicly available, is already in T2's possession from a source other than Subscriber or otherwise known to it, or was rightfully obtained by T2 from third parties, T2 shall bear no responsibility for its disclosure, inadvertent or otherwise. Upon reasonable notice, Subscriber may inspect T2's facilities during regular T2 business hours to assure Subscriber of T2's compliance with this obligation.

Section 8.2 **Obligation of Subscriber to Protect.** The Software creates and stores databases of personal information of end-users and data relating to Subscriber on the computer system on which the Software is installed. Subscriber agrees to take all steps which it deems are appropriate to provide adequate security for that information.

Article 9. RESTRICTIONS ON USE OF THE SOFTWARE

Section 9.1 **No Distribution.** Subscriber may not distribute or sublicense the Software to any person.

Section 9.2 **No Sublicense; Persons Authorized to Use.** Subscriber may not resell accounts or sublicense persons to use the Software other than Authorized Concurrent Users.

Section 9.3 **No Reverse Engineering.** Subscriber agrees that it will not create or attempt to create or permit others to create or attempt to create, by reverse engineering or otherwise, the source programs for the Software or any part thereof from the object program or from other information made available under the Agreement (whether oral, written, tangible or intangible).

Section 9.4 **Limited Copies.** Subscriber is authorized to make copies of the Software, to the extent copies are reasonably required for back-up and archival purposes or for internal business operations. Subscriber agrees that while the Agreement is in effect, or while it has custody or possession of any property of T2, Subscriber will not copy or duplicate, or permit anyone else to copy or duplicate, any physical, magnetic, electronic or other version of the Software, beyond the number of authorized Production Copies subscribed pursuant to this Agreement, and Client Components which are installed on Authorized Concurrent Users' devices. Subscriber may modify the documentation as necessary for its internal purposes, but shall not alter or remove any proprietary notice in the documentation, including but not limited to T2's name, logo and copyright notice.

Section 9.5 **Export.** Subscriber shall not permit any copy (in any medium) of all or any portion of the Software to be transmitted to or located outside of the United States except with T2's prior written consent and compliance by Subscriber with any applicable export or import requirements.

Section 9.6 **Passwords.** Subscriber shall not: (i) transmit or share identification and/or password codes to persons other than the Authorized Concurrent Users for whom such codes were generated; (ii) permit Authorized Concurrent Users to share identification and/or password codes with others; or (iii) permit the identification and/or password codes to be cached in proxy servers and accessed by individuals who are not Authorized Concurrent Users.

Article 10. PROPRIETARY PROTECTION

Section 10.1 **T2 Confidential Information.** Subscriber and Subscriber's subsidiaries recognize that the source code for the Software, and all specifications, techniques, manuals (other than end-user materials), system documentation and other materials relating to the operation of the Software which are disclosed or made available to Subscriber by T2 pursuant to this Agreement (collectively, "**T2 Proprietary Material**") are confidential, proprietary and trade secret and are protected by law. The Agreement does not give Subscriber the right to have access to any source code for the Software.

Section 10.2 **Other Proprietary Information.** T2 and Subscriber each may provide the other information which it treats as confidential or proprietary and which either (a) it has marked "Confidential" or "Proprietary," or (b) a reasonable person in the circumstances would understand to be confidential or proprietary ("**Proprietary Material**"). The receiving party agrees: (a) not to use Proprietary Material it receives from the disclosing party for any purpose other than performing its obligations and exercising its rights under this Agreement; (b) to exercise at least the same care to maintain the confidentiality of the Proprietary Material as it does its own confidential information of the same type; and (c) not to disclose the Proprietary Material to any third party, except that it may disclose Proprietary Material (i) on a confidential basis to its affiliates and its and its affiliates' attorneys, accountants, consultants, lenders, potential lenders and financial, tax, technical and other advisors who agree to keep it confidential, (ii) when required to comply with applicable laws or governmental regulations, (iii) in response

to a subpoena or other legal process provided that, if permitted by law, it first notifies the disclosing party and, to the extent possible, gives the disclosing party a reasonable opportunity to challenge the disclosure and (iv) on tax returns or in connection with any examination or audit thereof. "Proprietary Material" shall not include information received from a party which: (i) is in the other party's possession without actual or constructive knowledge of an obligation of confidentiality with respect thereto, prior to disclosure by the party; (ii) is or subsequently becomes part of a public domain through no fault of the other party; (iii) is disclosed to the other party by a third party having no obligation of confidentiality with respect thereto, and provided the other party did not have actual or constructive knowledge that such information was wrongfully disclosed by such third parties; or (iv) is independently developed by the other party.

Section 10.3 **Reproduction of Marks.** Subscriber agrees that any copies made of the Software, Handheld Software, any other T2 Proprietary Material and any other material obtained from T2 shall preserve unaltered patent, trademark, copyright, proprietary or confidentiality notices contained therein.

Section 10.4 **Patent and Copyright Indemnity.** T2 warrants that the Software and any materials developed by T2 and provided by T2 to Subscriber will not infringe on any United States copyright or patent. Should any legal action be made against Subscriber based on infringement of a United States copyright or patent as a result of the Software or the Professional Services, Subscriber shall promptly notify T2 and T2 shall defend the action at its expense. T2's liability in that event will be limited to defending the action and payment of any resulting court costs and damages finally awarded against Subscriber in the action. T2's obligations pursuant to this Section 10.4 shall not apply to any infringement caused by or resulting from Subscriber modifications or attempted modifications to any relevant system, or from Subscriber's failure to implement changes or updates furnished by T2 to Subscriber during the term of this Agreement.

Article 11. CORRECTION OF ERRORS

Section 11.1 **Correction of Functionality of the Software.** The liability of T2 for the functionality of the Software is limited, except as provided below in this Section, to the warranty provided in Section 1.3. If, thirty (30) days after the giving of the required notice described in Section 1.3, the Software fails to so conform, and the failure to conform is occasioned by T2's error and not operator error, faulty data or hardware failures, then, Subscriber may, at its election at any time thereafter while the failure remains uncured, send T2 a written notice that: (i) T2 has continued to fail to correct the failure; and (ii) Subscriber has elected to terminate the subscription of the Software. Upon the continuance of that failure for a period of thirty (30) days after such written notice of the continuance of such failure to correct and Subscriber's election to terminate has been given to T2 by the Subscriber ("cure period"), Subscriber may, and its exclusive remedy shall be to, terminate the subscription granted pursuant to the Agreement within sixty (60) days after the expiration of the cure period by the destruction of the materials described in Section 7.4, and have returned to it, (to the extent the amounts have not been previously refunded) the Subscription Fee, under Section 6.1 of this Agreement theretofore paid to T2 for the initial Subscription Term. If Subscriber fails to return the materials within thirty (30) days after the expiration of the cure period, Subscriber shall have waived its right to terminate the subscription and to receive a refund of the Subscription Fee.

Section 11.2 **Correction of Support Errors.** T2's liability under Article 5 is limited as provided in this Section 11.2. T2 commits to use commercially reasonable

efforts repair "minor" bugs, which are errors that support a "work around" solution (a "**Minor Error**"), in the next production release of the Software, which would typically occur in ninety (90) days or less. New production releases (beta releases) are heavily tested by T2's technical staff and, typically, by beta site Subscribers, meaning that "critical" bugs, which are errors that would stop a Subscriber from processing (a "**Critical Error**" and together with a Minor Error, an "**Error**") rarely make it into a production release. Nevertheless, if a Critical Error makes it into a production release, T2 commits to use commercially reasonable efforts to distribute a software patch within forty-eight (48) hours of T2's receipt of notice of the Critical Error. If an Error continues for a period of sixty (60) days after that detailed written notice has been given to T2 by Subscriber ("cure period"), Subscriber may, and its exclusive remedy shall be to terminate the subscription of the Software by certifying destruction of the Software and other materials in the manner provided in Section 7.4 within thirty (30) days after the expiration of the cure period and, upon such certification, have returned to it the prorated consideration representing Subscriber's payment of the Subscription Fee for the days remaining in the then current Subscription Term computed from the date of T2's receipt of the termination notice.

Section 11.3 **Correction of Hardware Errors.** T2's liability under Article 2 is limited as provided in this Section 11.3. If after giving T2 notice of the Hardware Error, T2 fails to repair or replace the faulty Hardware, then, Subscriber may, at its election at any time thereafter while the Hardware Error remains uncured, send T2 written notice that (i) T2 has continued to fail to correct the Hardware Error and (ii) Subscriber has elected to terminate the Hardware Support services. If the Hardware Error continues for a period sixty days (60) after that detailed written notice has been given to T2 by Subscriber ("cure period"), Subscriber may, and its exclusive remedy shall be to request that T2 return the Hardware and have returned to it the prorated consideration representing Subscriber's payment for the Hardware repair and support.

Section 11.4 **Correction of Professional Services Errors.** Subscriber shall notify T2 within thirty (30) days' time after T2 advises Subscriber of its completion of the work in question when the Professional Services do not execute in accordance with the Subscriber's specifications. The notification shall include the detailed variances and the information necessary for T2 to verify the variances. T2, upon actual receipt of the notification and verification of the detailed variances, shall modify the work so that it shall conform to the Subscriber specifications. The passage of the thirty (30) day period after T2 advises the Subscriber that the work is completed without the notification described herein shall constitute final satisfaction of the express warranty and the warranty period described above.

Article 12. REMEDIES

Section 12.1 **Waiver of Jury Trial.** Each party hereto hereby waives to the fullest extent permitted by applicable law, any right it may have to a trial by jury in respect of any claim, litigation or proceeding directly or indirectly arising out of, under or in connection with this Agreement.

Section 12.2 **Time to Sue.** No action, regardless of form, arising out of any of the transactions pursuant to this Agreement may be brought by Subscriber more than one year after the cause of action accrued.

Section 12.3 **No Other Liability.** Except to the extent provided in **Error! Reference source not found.**~~Section 2.2~~, Section 3.9 and Article 11, T2 and its third

party licensors shall not be responsible for any claims against Subscriber by any other party nor shall T2 or its third party licensors be liable for any property damage, personal injury, loss or inaccuracy of data, loss of profits or revenues, interruption of business, out-of-pocket expenses or any other direct, indirect, special, consequential or incidental damages, however caused, whether based on contract, tort (including negligence), strict liability, warranty, statutory rights or any other basis arising out of Subscriber's use of the Software, the provision of support, consulting or the marketing, delivery or supporting thereof, or otherwise arising pursuant to this Agreement. In the event any of the foregoing limitations of liability are void or are not effective, Subscriber agrees that the liability of T2 and its third party licensors for damages, if any, shall not exceed the Subscription fees paid by Subscriber to T2 for the three (3) months preceding the earliest event giving rise to the liability. With respect to Professional Services, in the event any of the foregoing limitations of liability are void or not effective, Subscriber agrees that T2's liability shall in no case exceed the amounts paid to T2 by Subscriber under this Agreement for Professional Services, or parts thereof, involved in the claim and not otherwise reimbursed. If only a part of the Professional Services is the subject of a claim, then T2's liability shall be limited to the amount which T2 may have theretofore allocated to that part of the Professional Services of this Agreement, in the ***Quote***, in any invoice of statement rendered, or to the amount as may be allocated by T2 in its good faith discretion to the part of the Professional Services. T2 shall not be liable for any lost profits or for any claim or demand against Subscriber by any other party.

Article 13. DEFINED TERMS

Section 13.1 **Agreement.** The "Agreement" between T2 and Subscriber consists of this Software Subscription Agreement and the ***Quote***.

Section 13.2 **Authorized Hosting Provider.** An "Authorized Hosting Provider" means T2 or its subcontractors.

Section 13.3 **Authorized Purposes.** Subscriber's "Authorized Purposes" are the use of the Software for the Subscriber's internal parking business operations.

Section 13.4 **Authorized Concurrent Users.** The number of "Authorized Concurrent Users" is set forth in the ***Quote***. Subscriber may increase the number of Authorized Concurrent Users in the manner provided for in the ***Quote***.

Section 13.5 **Client Components.** The "Client Components" are components of the Software, which T2 makes available for downloading by Authorized Concurrent Users onto a personal computer or other personal electronic storage device solely for Authorized Purposes.

Section 13.6 **Cooperation.** "Cooperation" is defined in Section 5.5.

Section 13.7 **Critical Error.** A "Critical Error" is defined in Section 11.2.

Section 13.8 **Effective Date.** The "Effective Date" is the date of this Agreement.

Section 13.9 **Technical Support.** "Technical Support" includes:

Service	T2 Hosted Customers	Self Hosted Customers
Assistance with upgrading T2 Flex Software	Included	Excluded
Assistance with upgrades to Oracle database releases	Included	Excluded
Assistance with installation of Oracle patches	Included	Excluded
Access to Crystal Reports library of 400+/- reports	Included	Included
Authorized Concurrent Users may participate in on-line T2 Systems training on Software upgrades	Included	Included
Database rebuilds or repairs	Included	Excluded

Section 13.10 **Professional Services.** "Professional Services" shall have the meaning set forth in Section 4.1.

Section 13.11 **Guaranteed Minimum Commitment.** Subscriber shall be liable for the remainder of the current annual subscription fee once each annual term commences. Notwithstanding anything to the contrary contained herein, if the Software Subscription Agreement is terminated by T2 Systems for cause or by Subscriber for convenience prior to the expiration of the Guaranteed Minimum Commitment, the unpaid balance for the Guaranteed Minimum Commitment shall accelerate and be due and payable in full immediately upon acceleration.

Section 13.12 **Hardware Error.** "Hardware Error" shall mean a defect in the Hardware that prevents Subscriber and its Authorized Concurrent Users from accessing the Software through the Hardware.

Section 13.13 **Hardware Fee.** "Hardware Fee" shall mean the fee set forth in the ***Quote*** for the initial term of. The Hardware Fee is subject to change as provided in Section 6.2.

Section 13.14 **Hosting Error.** "Hosting Error" shall mean a defect in the Hosting System that prevents Subscriber and its Authorized Concurrent Users from accessing the Software through the Hosting Services.

Section 13.15 **Hosting Services Fee.** "Hosting Services Fee" shall mean the fee set forth in the ***Quote*** for the initial term of the Hosting Services. The Hosting Fee is subject to change as provided in Section 6.2.

Section 13.16 **Hosting Services.** "Hosting Services" shall mean that T2 will install, operate, and maintain the Software on T2's Application Server, and provide to Subscriber access to T2's Application Server sufficient for Subscriber to exercise its subscription rights granted herein and for the Authorized Concurrent Users to communicate with, access and use the Software by way of the Internet.

Section 13.17 **Hosting System.** "Hosting System" shall mean the computer and network equipment owned and maintained by T2 or its designated third party and the operating software licensed by T2 or its designated third party.

Section 13.18 **Installation Date.** "Installation Date" shall mean the date the Flex application goes into production mode.

Section 13.19 **Minor Error.** A "Minor Error" is defined in Section 11.2.

Section 13.20 **Production Copy.** A "Production Copy" is an executable code copy of the Software which is used on a computer system to process live data. Copies of all or a portion of the Software whether on multiple computers or on a computer system will constitute a single Production Copy so long as a single database is used by all of the copies of the Software. The number of Production Copies authorized under this Agreement is one, unless otherwise set forth in the ***Quote***.

Section 13.21 **Professional Services Fee.** "Professional Services Fee" shall mean the fee set forth in the ***Quote*** for the initial term of the Professional Services. The Professional Fee is subject to change as provided in Section 6.2.

Section 13.22 **Proprietary Material.** "Proprietary Material" shall have the meaning set forth in Section 10.1.

Section 13.23 **Remote Access Equipment.** "Remote Access Equipment" shall mean the equipment necessary for Subscriber to access the services on the Internet. The Remote Access Equipment is to be provided by Subscriber.

Section 13.24 **Subscriber.** The "Subscriber" is identified in this agreement.

Section 13.25 **Subscriber Data.** "Subscriber Data" shall mean the data provided to T2 by Subscriber and the Authorized Concurrent Users, including data regarding Authorized Concurrent Users.

Section 13.26 **Subscription Fee.** The "Subscription Fee" for the initial Subscription Term is set forth in the ***Quote***. The Subscription Fee for the terms after the initial Subscription Term may be changed as provided in Section 6.2.

Section 13.27 **Subscription Term.** The initial "Subscription Term" commences on the earlier of the Install Date or three (3) months from the Effective Date and extends for the period specified in the ***Quote***. Each subsequent Subscription Term is for a period of one (1) year.

Section 13.28 **Software.** The "Software" is specified in the ***Quote*** and consists of T2 Flex® and all related software components including but not limited to, handheld ticket-writer software as specified in the ***Quote***.

Section 13.29 **Target Response Time.** The "Target Response Time" is the time period during support hours in which T2 will strive to communicate with the Subscriber acknowledging a support request by the Subscriber.

Section 13.30 **Quote.** The Software Subscription Agreement is the document executed by T2 and Subscriber which incorporates the "***Quote***" by reference.

Section 13.31 **Standard Technical Support.**"Standard Technical Support" includes responses to questions of error by email or telephone.

Section 13.32 **T2 Proprietary Material.** "T2 Proprietary Material" is defined in Section 10.1.

Section 13.33 **Time and Materials Basis.** "Time and Materials Basis" means an hourly basis at the rate specified in the ***Quote***, together with reimbursement of expenses.

Section 13.34 **Web Site.** "Web Site" means the Web Site prototype provided by T2, and subsequently customized at Subscriber's request.

Section 13.35 **Web Site Fee.** The "Web Site Fee" for the Web Site is identified in the ***Quote***.

Section 13.36 **Wrap-Up Period.** "Wrap-Up Period" shall have the meaning set forth in ***Quote***

Article 14. MISCELLANEOUS

Section 14.1 **Escrow of Source Code.** T2 entered into a source code escrow agreement with Lincoln Parry Software, Inc. (the "**Escrow Agreement**") providing for the deposit of the source code programs for the executable version of the Software into an escrow account. The Escrow Agreement further provides, subject to the terms and conditions for which Subscriber agrees to be bound, that the escrow agent may release the source code to Subscriber upon the occurrence of one of the release event(s) specified therein. T2 will provide a copy of the Escrow Agreement to the Subscriber upon request. The Escrow Agreement provides that the Trustee shall deliver a copy of the source code to the Subscriber only if the Subscriber has satisfied the procedures and conditions set forth in the Escrow Agreement, including, the execution of the Non-Disclosure Covenant attached thereto. Upon release of the source code, the Subscriber is authorized to copy, modify, and create derivative works based on the source code for the sole purpose of debugging and maintaining the Software. The Subscriber shall remain entitled to keep a copy of the source code so long as the Subscriber continues to pay the Subscription Fee under this Agreement. Also, Subscriber shall pay to T2, within fifteen (15) days of receipt of invoice, the annual administrative fee of Lincoln Parry Software, Inc. Subscriber shall remain obligated to pay T2 the Subscription Fee notwithstanding the release of the source code for the Software from the escrow.

Section 14.2 **Notices.** Any notices or other communications required or permitted to be given or delivered under the Agreement shall be in writing and shall be delivered to T2 at its address specified on its web site or to Subscriber at its address specified in the ***Quote*** or to such other address as either party may, from time to time, designate to the other in writing.

All notices to T2 shall be to the attention of the CEO of T2. Any notice given shall be deemed to have been received on the date on which it is delivered personally, by courier service or by facsimile or, if mailed, on the third business day next following the mailing thereof.

Section 14.3 **No Partnership.** Nothing in this Agreement shall be deemed to create a partnership, joint venture or agency relationship.

Section 14.4 **Survival.** The provisions of Section 1.4, Section 3.9, Section 3.10, Section 6.3, Section 6.5, Section 7.4, Section 7.6, Article 8, Article 10, Article 11, Article 12, Section 14.4 and Section 14.6, and all obligations of Subscriber to pay or reimburse T2 for any amounts arising under this Agreement, shall survive any termination of either this Agreement or the non-exclusive subscription granted hereunder.

Section 14.5 **Publicity.** Subscriber agrees that T2 may identify Subscriber as a customer in the customer lists or other similar communications. T2 agrees not to use Subscriber's name in any other public releases or in any case histories except with Subscriber's prior consent which Subscriber agrees not to unreasonably withhold or delay.

Section 14.6 **Governing Law.** Regardless of the place of execution, delivery, performance or any other aspect of this Agreement, this Agreement and all of the rights of the parties under this Agreement shall be governed by, construed under and enforced in accordance with the substantive law of the United States of America and of the State of Indiana without regard to conflict of laws principles.

Section 14.7 **Severability.** If any provision in the Agreement shall be held to be in contravention of applicable law, the Agreement shall be construed as if that provision were not a part thereof and in all other respects the terms of the Agreement shall remain in full force and effect.

Section 14.8 **No Waiver.** No waiver of any covenant or condition or the breach of any covenant or condition of the Agreement shall be deemed to constitute a waiver of any subsequent breach of the covenant or condition nor justify or authorize a non-observance upon any occasion of that covenant or condition or any other covenant or condition of the Agreement.

Section 14.9 **Entire Agreement.** The Agreement (consisting of this Software Subscription Agreement and the ***Quote***) constitutes the entire agreement between the parties hereto with regard to the Software, any Hosting Services, any Development Services, and any support of the Software.

Section 14.10 **Additional Work.** If Subscriber requires additional work and/or integrations not included in this Agreement and attached Quote, T2 and Subscriber shall negotiate the additional work, mutually agree on the scope and compensation, and document the terms in either a separate Agreement or an amendment to this Agreement per the purchasing requirements of the Subscriber.

Section 14.11 **Piggyback Cooperative Purchasing.** Subscriber agrees to allow this contract to be used for purposes of piggyback purchasing. Under piggyback purchasing, Subscriber and T2 agree to open the contract for the use of other public or state agencies with the stipulation the other state agencies will be offered the same prices, terms, and

conditions as that of Subscriber. The contract is mandatory for Subscriber and optional for all other state agencies.

Section 14.12 **Arbitration.** Except for actions to protect Proprietary Rights and to enforce an arbitrator's decision hereunder, all disputes, controversies, or claims arising out of or relating to this Agreement or a breach thereof shall be submitted to and finally resolved by arbitration under the rules of the American Arbitration Association ("AAA") then in effect. There shall be one arbitrator, and such arbitrator shall be chosen by mutual agreement of the parties in accordance with AAA rules. The arbitration shall take place in Indianapolis, Indiana. The arbitrator shall apply the laws of the State of Indiana to all issues in dispute. The findings of the arbitrator shall be final and binding on the parties, and may be entered in any court of competent jurisdiction for enforcement. Legal fees shall be awarded to the prevailing party in the arbitration.

IN WITNESS WHEREOF, the parties have caused this Agreement to be duly executed as of the Effective Date.

T2 Systems, Inc.

By: [redacted]

Name: Tim Kenton

Title: COO

City of Bloomington, Illinois

By: [redacted]

Name: Scott A. Sprouls

Title: I.S. Director

EXHIBIT: PCI AND PA DSS COMPLIANCE

I. DEFINITIONS

A **Self Hosted Subscriber**'s instance of T2 Flex and the T2 Credit Card Solution is installed entirely on the Subscriber's site(s). A **T2 Hosted Subscriber**'s instance of T2 Flex and the hosted components of the T2 Systems Credit Card Solution are installed and run in the T2 Hosting Environment. A T2 Hosted Subscriber has both hosted and Non-Hosted Components.

The **Standard Network** is part of the T2 Hosting Environment and contains T2 Flex servers, T2 e-Business Solutions Servers, and other equipment. T2 Hosted Subscribers who do not process payments through the Hosting Environment use only the Standard Network. The Standard Network uses standard, commercially reasonable security practices to control and protect the transmission of data to and from the Hosting Environment.

The **Payment Network** is part of the T2 Hosting Environment and is used solely for payment processing. T2 Hosted Subscribers who process payments through the Hosting Environment use the Standard Network for routine Flex T2 e-Business Solutions operational processes and the Payment Network for payment processing. The Payment Network is secured to the Payment Card Industry Data Security Standard (PCI DSS) . T2 Systems is responsible for maintaining PCI DSS compliance of the T2 Hosting Environment Payment Network.

Non-Hosted Components are considered to be any software components of T2 Flex, T2 e-Business Solutions, and/or the T2 Systems Credit Card Solution installed on hardware located at the Subscriber site(s) and any hardware located at the Subscriber site(s). Non-Hosted Components are not part of the T2 Hosting Environment, the Standard Network, or the Payment Network, and are not the responsibility of T2 Systems.

The **T2 Hosting Environment** includes the T2 servers, networking equipment, and related devices located at T2's data center, and the software and data that reside on that equipment. There are two networks within the T2 Hosting Environment: Standard and Payment.

II. T2 SYSTEMS RESPONSIBILITIES

T2 Systems shall provide Payment Card Industry Payment Application Data Security Standard (PCI PA-DSS) validated software for processing credit card payments (T2 Systems Credit Card Solution), including a PA-DSS Implementation Guide containing guidelines for installing and configuring the T2 Systems Credit Card Solution to support Payment Card Industry Data Security Standard (PCI DSS) compliance. T2 Systems shall maintain the PCI PA-DSS validation of the T2 Systems Credit Card Solution its PA-DSS Implementation Guide.

Note: Use of PCI PA-DSS validated software and its PA-DSS Implementation Guide does not guarantee merchant's PCI DSS compliance. For complete and current PCI DSS requirements, Subscribers should reference the Payment Card Industry Security Standards Council™ (PCI SSC) website at www.pcisecuritystandards.org.

For both the Standard and Payment Networks, T2 is responsible for the security of the data once it is inside the Hosting Environment and for using commercially reasonable data security practices to control and protect the transmission of data to and from the Hosting Environment.

T2 Systems shall maintain the Payment Network in a validated PCI DSS compliant environment, including use of PCI PA-DSS validated software for processing credit card payments, the T2 Systems Credit Card Solution, configured as directed by its PA-DSS Implementation Guide.

III. SUBSCRIBER RESPONSIBILITIES

Subscribers are responsible for providing and maintaining a Payment Card Industry Data Security Standard (PCI DSS) compliant environment at their site(s) in which components of the T2 Systems Credit Card Solution may be installed, and for validation of that environment as required by their payment gateway, merchant bank, payment brand, or other entity with which the Subscriber is contracted to process payments.

The Subscriber is responsible for configuring T2 Systems Credit Card Solution according to the PA-DSS Implementation Guide.

Once the T2 Systems Credit Card Solution has been implemented at the Subscriber site(s), Subscribers are responsible for maintaining Non-Hosted Components of the T2 Systems Credit Card Solution, including implementation in a timely manner of any updates to the T2 Systems Credit Card Solution software and/or PA-DSS Implementation Guide provided by T2 Systems.

Please note: Acceptance of a given payment application by the PCI Security Standards Council, LLC (PCI SSC) only applies to the specific version of that payment application that was reviewed by a PA-QSA and subsequently accepted by PCI SSC (the "Accepted Version"). If any aspect of a payment application or version thereof is different from that which was reviewed by the PA-QSA and accepted by PCI SSC – even if the different payment application or version (the "Alternate Version") conforms to the basic product description of the Accepted Version – then the Alternate Version should not be considered accepted by PCI SSC, nor promoted as accepted by PCI SSC.

No vendor or other third party may refer to a payment application as "PCI Approved" or "PCI SSC Approved", and no vendor or other third party may otherwise state or imply that PCI SSC has, in whole or part, accepted or approved any aspect of a vendor or its services or payment applications, except to the extent and subject to the terms and restrictions expressly set forth in a written agreement with PCI SSC, or in a PA-DSS letter of acceptance provided by PCI SSC. All other references to PCI SSC's approval or acceptance of a payment application or version thereof are strictly and actively prohibited by PCI SSC.

When granted, PCI SSC acceptance is provided to ensure certain security and operational characteristics important to the achievement of PCI SSC's goals, but such acceptance does not under any circumstances include or imply any endorsement or warranty regarding the payment application vendor or the functionality, quality, or performance of the payment application or any other product or service. PCI SSC does not warrant any products or services provided by third parties. PCI SSC acceptance does not, under any circumstances, include or imply any product warranties from PCI SSC, including, without limitation, any implied

warranties of merchantability, fitness for purpose or noninfringement, all of which are expressly disclaimed by PCI SSC. All rights and remedies regarding products and services that have received acceptance from PCI SSC, shall be provided by the party providing such products or services, and not by PCI SSC or any payment brands.

IV. Newly Discovered Security Vulnerabilities

T2 Systems shall provide notice to the Subscriber of any newly discovered security vulnerabilities in the T2 Systems Credit Card Solution and, for T2 Hosted Subscribers, in the T2 Hosting Environment Payment Network, and provide network security updates, software updates, and/or updates to the PA-DSS Implementation Guide to remedy those vulnerabilities as soon as is reasonable and practical following discovery of the vulnerability.

T2 Systems is not responsible for providing notice to T2 Subscribers regarding security vulnerabilities in non-T2 software or hardware that do not require changes to the T2 Systems Credit Card Solution, the T2 Systems Credit Card Solution PA-DSS Implementation Guide, and/or the T2 Hosting Environment Payment Network that do not affect configuration of hosted or Non-Hosted Components.

For Non-Hosted Components, Subscribers are responsible for installing software updates provided by T2 Systems to remedy any newly discovered security vulnerabilities in the T2 Systems Credit Card Solution and for making any changes identified in updates to the PA-DSS Implementation Guide as soon as is reasonable and practical.

Subscribers are responsible for notifying T2 Systems as soon as is reasonable and practical should the Subscriber discover a security vulnerability in or related to the T2 Hosting Environment Payment Network (T2 Hosted Subscribers only), the T2 Systems Credit Card Solution, and/or the T2 Systems Credit Card Solution PA-DSS Implementation Guide.

V. Information Security Breach

Subscribers are responsible for notifying T2 Systems should an information security breach of or relating to the T2 Systems Credit Card Solution and/or T2 Systems Hosting Environment Payment Network (T2 Hosted Subscribers only) occur as soon as law enforcement and contractual obligations to other payment entities require and/or allow. T2 Hosted Subscribers shall follow the instructions in the most recent version of the T2 Hosting Environment Hosted Subscriber Security Incident Response Plan. The Plan will be e-mailed to T2 Hosted Subscribers annually or as it is updated.

T2 Systems shall notify Subscribers of any security breach of or relating to the T2 Systems Credit Card Solution and/or T2 Systems Hosting Environment Payment Network as soon as law enforcement and contractual obligations to other Subscribers and payment entities require and/or allow. Notification of T2 Hosting Environment breaches not related to a security vulnerability in the T2 Systems Credit Card Solution may be made to T2 Hosted Subscribers only.

T2 Systems shall cooperate with law enforcement and assist with the investigation of any security breach of or relating to the T2 Systems Credit Card Solution and/or T2 Systems Hosting Environment Payment Network.

VI. TERMINATION OF SERVICES (T2 HOSTED SUBSCRIBERS ONLY)

T2 Hosted Subscribers

- who persist in material deviations from the PA-DSS Implementation Guide not approved by the T2 Systems Chief Information Officer, or
- who persist in material non-PCI DSS compliant security practices, or
- who fail to implement updates to the T2 Systems Credit Card Solution software and/or PA-DSS Implementation Guide in a timely manner, or
- who fail to report a security breach as required by the T2 Hosting Environment Hosted Subscriber Security Incident Response Plan, or
- whose operation is deemed by T2 Systems to be a material risk to the security of the T2 Hosting Environment,

may be disconnected from the T2 Hosting Environment Payment Network or the T2 Hosting Environment in its entirety at the discretion of the T2 Systems Chief Information Officer.

CONSENT AGENDA ITEM NO. 7.D

FOR COUNCIL: October 10, 2022

WARD IMPACTED: Ward 8

SUBJECT: Consideration and action to approve an Ordinance Approving the Final Plat of The Grove on Kickapoo Creek Sixth Addition, subject to the petitioner providing the required sureties and tap-on fees, as requested by the Public Works Department.

RECOMMENDED MOTION: The proposed Ordinance be approved, subject to the petitioner providing the required sureties and tap-on fees.

STRATEGIC PLAN LINK:
Goal 4. Strong Neighborhoods
Goal 5. Great Place - Livable, Sustainable City

STRATEGIC PLAN SIGNIFICANCE:
Objective 4c. Preservation of property/home valuations
Objective 5a. Well-planned City with necessary services and infrastructure
Objective 5b. City decisions consistent with plans and policies

BACKGROUND: The Grove on Kickapoo Creek Sixth Addition Subdivision is located north of Longfield Road. The proposed Final Plat facilitates the creation of 60 residential lots and two outlots. The lot configuration is consistent with the Subdivision's Preliminary Plan approved by Council on December 12, 2011. In compliance with city code, the preliminary plan has remained active with the platting of the Eighth Addition on July 26, 2021. The existing Parcel Identification Numbers (PIN) for the property are 22-08-426-028, 22-08-426-030, and 22-08-426-031.

The zoning in this area is R-1B, Single-Family Residence District. Approval of this final plat will facilitate new residences. The proposed use is permitted in this zoning district. The final plat complies with City engineering standards (Manual of Practice and Chapter 24 of City Code). City staff has no objections to the plat.

COMMUNITY GROUPS/INTERESTED PERSONS CONTACTED: Eastlake, LLC

FINANCIAL IMPACT: Eastlake, LLC, paid all survey and plat costs. Tap-on fees are required and the surety requirement is met with a $250,000 revolving bond. See tap-on/surety attachment for additional information. Approval of the Final Plat will facilitate the construction of new residential housing. This could result in additional property tax revenues for the City.

AMERICAN RESCUE PLAN FUNDING IMPACT: N/A

COMMUNITY DEVELOPMENT IMPACT: **This request meets the following goals and**

objectives of the Bloomington Comprehensive Plan 2035: Goal, H-1. (Ensure the availability of safe, attractive and high-quality housing stock to meet the needs of all current and future residents of Bloomington), H-1.1 (Ensure that the housing to accommodate the new growth is a broad range (of types, sizes, ages, densities, tenancies and costs) equitably distributed throughout the City recognizing changing trends in age-group composition, income, and family living habits), and UEW-1.2b (Prioritize new development where City services are available or can be extended efficiently and economically)

Respectfully submitted for consideration.

Prepared by: Steven Law, Civil Engineer II

ATTACHMENTS:
PW 1B ORDINANCE The Grove on Kickapoo Creek Sixth Addition Final Plat 2
PW 1C FINAL PLAT The Grove on Kickapoo Creek Sixth Addition Final Plat 10102022
PW 1D OWNERS PETITION The Grove on Kickapoo Creek Sixth Addition Final Plat 10102022
PW 1G SCHOOL DISTRICT CERTIFICATE The Grove on Kickapoo Creek Sixth Addition Final Plat 10102022
PW 1E COUNTY CLERKS CERTIFICATE The Grove on Kickapoo Creek Sixth Addition Final Plat 10102022
PW 1F OWNERS CERTIFICATE The Grove on Kickapoo Creek Sixth Addition Final Plat 10102022
PW 1H FINAL PLAT CHECKLIST The Grove on Kickapoo Creek Sixth Addition Final Plat 10102022
PW 1I FINAL PLAT MAP The Grove on Kickapoo Creek Sixth Addition Final Plat 10102022
PW 1J TAP ON MEMO The Grove on Kickapoo Creek Sixth Addition Final Plat 10102022
PW 1K DRAINAGE STATEMENT The Grove on Kickapoo Creek Sixth Addition Final Plat 10102022

ORDINANCE NO. 2022 - _____

AN ORDINANCE APPROVING THE FINAL PLAT OF THE GROVE ON KICKAPOO CREEK SIXTH ADDITION

WHEREAS, there was heretofore filed with the City Clerk of the City of Bloomington, McLean County, Illinois, a Petition for approval of the Final Plat of The Grove on Kickapoo Creek Sixth Addition dated September 2, 2022, legally described in Exhibit A attached hereto and made a part hereof by this reference; and

WHEREAS, said Petition requests no exemptions or variations from the provisions of the Bloomington City Code; and

WHEREAS, said Petition is valid and sufficient and conforms to the requirements of the statutes in such cases made and provided and the Final Plat attached to said Petition was prepared in compliance with the requirements of the Bloomington City Code;

WHEREAS, the proposed final plat is consistent with the preliminary plan which has been extended by action of the City Council within the meaning of Chapter 24, Section 3.2.9 through the final platting of the 8th Addition of the Grove on Kickapoo Creek on July 6th, 2021.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF BLOOMINGTON, MCLEAN COUNTY, ILLINOIS:

Section 1. The above recitals are incorporated into and made a part of this Ordinance as though fully set forth herein.

Section 2. The Final Plat of The Grove on Kickapoo Creek Sixth Addition dated September 2, 2022, is hereby approved.

Section 3. This Ordinance is enacted pursuant to the home rule authority of the City of Bloomington granted by Article 7, Section 6 of the 1970 Illinois Constitution.

Section 4. The City Clerk is hereby directed and authorized to publish this Ordinance in pamphlet form as provided by law.

Section 5. This Ordinance shall be effective immediately after its approval and publication as required by law.

PASSED this 10th day of October 2022.

APPROVED this _____ day of October 2022.

CITY OF BLOOMINGTON

_____
Mboka Mwilambwe, Mayor

ATTEST

_____
Leslie Smith-Yocum, City Clerk

Exhibit A

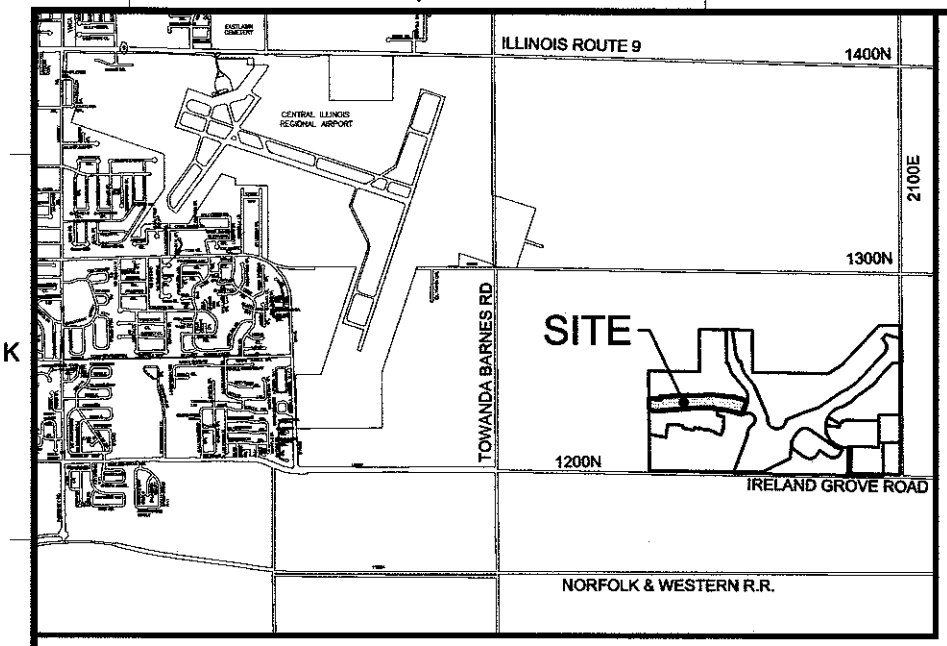
Description of Property

Outlot 360 in in The Grove on Kickapoo Creek Third Addition to the City of Bloomington, Illinois, according to the plat recorded as Document No. 2012-19531 in the McLean County Recorder's Office, and a part of the Southeast Quarter of Section 8 and a part of the Southwest Quarter of Section 9, Township 23 North, Range 3 East of the Third Principal Meridian, McLean County, Illinois, more particularly described as follows: Beginning at the Northwest Corner of Lot 25 in The Grove on Kickapoo Creek First Addition to the City of Bloomington, Illinois, according to the plat recorded as Document No. 2007-13421 in the McLean County Recorder's Office, said Northwest Corner being on the West Line of The Grove on Kickapoo Creek Stream Restoration in the City of Bloomington, Illinois, according to the plat recorded as Document No. 2012-19531 in said Recorder's Office. From said Point of Beginning, thence northeast 64.30 feet along said West Line which forms an angle of 111°-04'-26" as measured from west to northeast with the North Line of Lot 26 in said The Grove on Kickapoo Creek First Addition; thence northeast 297.19 feet along said West Line which forms an angle to the right of 180°-26'-47" with the last described course; thence northwest 210.00 feet along a line which forms an angle to the right of 90°-00'-00" with said West Line; thence southwest 11.55 feet along a line which forms an angle to the right of 90°-00'-00" with the last described course; thence northwest 135.50 feet along a line which forms an angle to the right of 272°-15'-05" with the last described course; thence west 147.06 feet along a line which forms an angle to the right of 165°-08'-08" with the last described course; thence west 304.43 feet along the arc of a non-tangential curve concave to the south with a radius of 3110.00 feet and the 304.31 foot chord of said arc forms an angle to the right of 182°-01'-19" with the last described course; thence west 86.01 feet along a line which forms an angle to the right of 173°-11'-23" with the last described chord; thence west 538.16 feet along a line which forms an angle to the right of 179°-09'-23" with the last described course; thence west 60.06 feet along a line which forms an angle to the right of 178°-45'-36" with the last described course; thence west 812.43 feet along a line which forms an angle to the right of 180°-00'-43" with the last described course; thence south 68.15 feet along a line which forms an angle to the right of 87°-26'-19" with the last described course; thence west 123.29 feet along a line which forms an angle to the right of 273°-48'-37" with the last described course; thence north 17.32 feet along a line which forms an angle to the right of 270°-00'-00" with the last described course; thence west 180.00 feet along a line which forms an angle to the right of 90°-00'-00" with the last described course to the West

Line of the East Half of the Southeast Quarter of Section 8; thence south 258.19 feet along said West Line which forms an angle to the right of 90°-00′-00″ with the last described course to the Northwest Corner of Outlot 360 in The Grove on Kickapoo Creek Third Addition to the City of Bloomington, Illinois, according to the plat recorded as Document No. 2012-19531 in said Recorder's Office; thence southeast 90.68 feet along the North Line of said Outlot 360 which forms an angle to the right of 128°-49′-54″ with the last described course to a Point of Curvature; thence southeasterly 74.43 feet along said North Line being the arc of a curve concave to the north with a radius of 100.00 feet and the 72.72 foot chord of said arc forms an angle to the right of 158°-40′-44″ with the last described course to a Point of Tangency; thence east 1211.35 feet along a line which forms an angle to the right of 158°-40′-44″ with the last described chord to a Point of Curvature; thence easterly 360.80 feet along the arc of a curve concave to the south with a radius of 2780.00 feet and the 360.54 foot chord of said arc forms an angle to the right of 183°-43′-05″ with the last described course to the Northeast Corner of said Outlot 360; thence south 30.06 feet along the East Line of said Outlot 360 which forms an angle to the right of 270°-05′-34″ with the last described chord to the Southeast Corner of said Outlot 360, said Southeast Corner also being the Northwest Corner of Kickapoo Creek Road as dedicated in said The Grove on Kickapoo Creek Third Addition; thence easterly and southeasterly 745.09 feet along the North Line of said Kickapoo Creek Road and the North Lines of Lots 32 through 26, inclusive, in said The Grove on Kickapoo Creek First Addition being the arc of a curve concave to the south with a radius of 2750.00 feet and the 742.82 foot chord of said arc forms an angle to the right of 101°-25′-38″ with the last described course; thence east 23.36 feet along a line which forms an angle to the right of 169°-00′-52″ with the last described chord to the Point of Beginning, containing 21.483 acres, more or less.

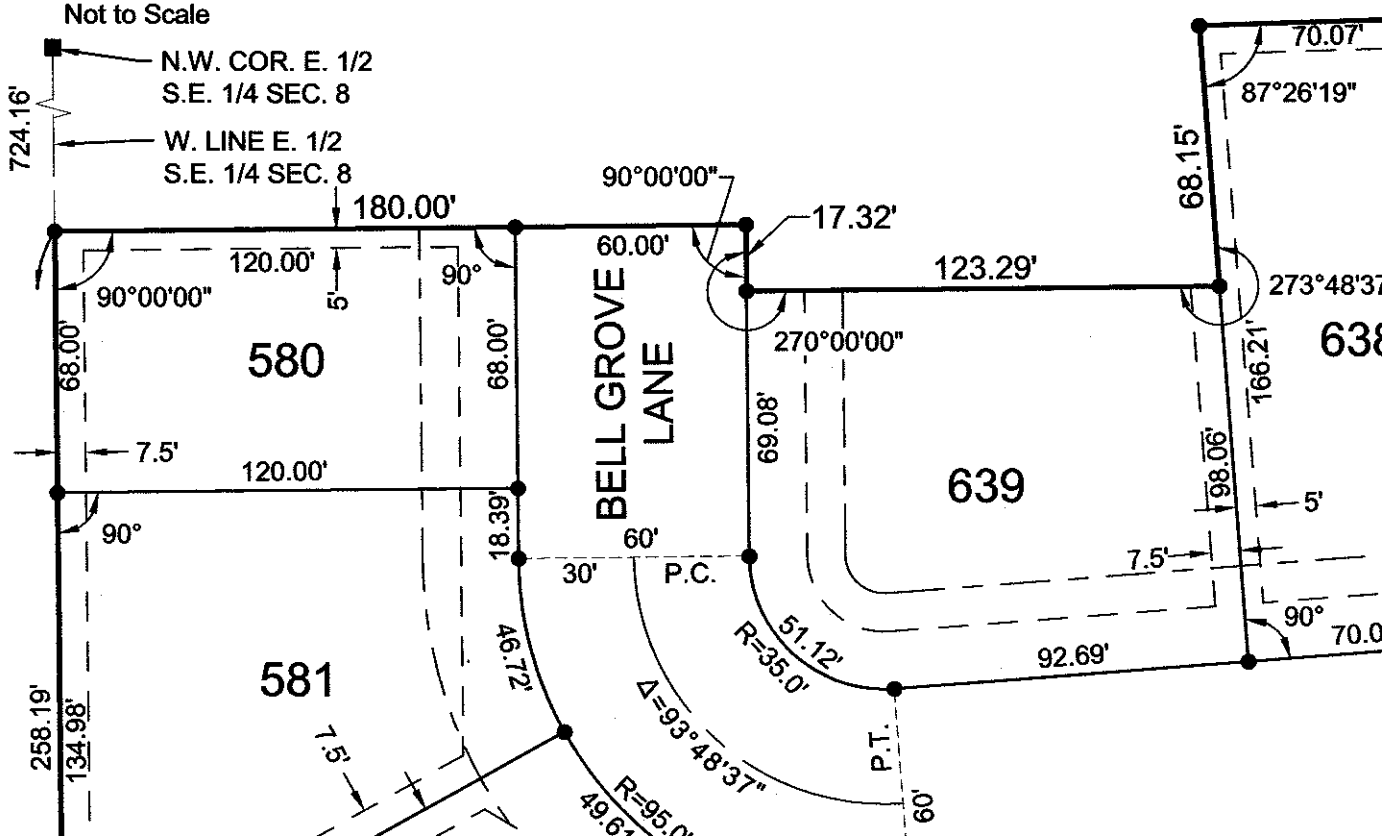
THE GR

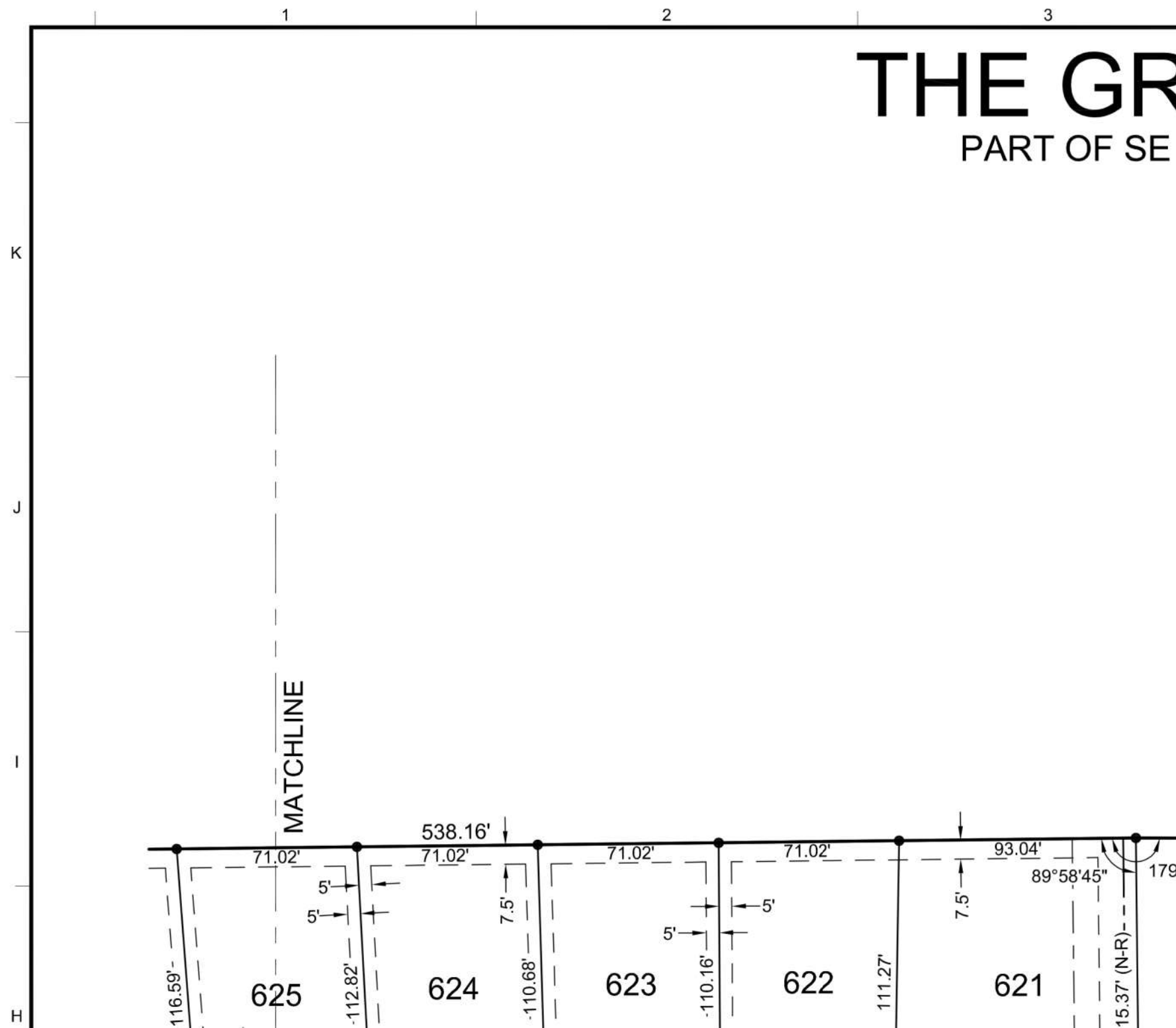
PART OF SE



Location Map

Not to Scale




1
2
3
K
J
I
H
THE GR
PART OF SE
MATCHLINE
538.16'
71.02'
71.02'
71.02'
71.02'
93.04'
89°58'45"
179
5'
5'
5'
5'
7.5'
7.5'
116.59'-
112.82'
110.68'
110.16'
111.27'
15.37' (N-R)
625
624
623
622
621

PETITION FOR APPROVAL OF FINAL PLAT

State of Illinois)
)ss.
County of McLean)

TO: THE HONORABLE MAYOR AND CITY COUNCIL OF THE TOWN OF NORMAL, McLEAN COUNTY, ILLINOIS

Now come(s) **Eastlake, L.L.C., an Illinois limited liability company,**

hereinafter referred to as your petitioner(s), respectfully representing and requesting as follows:

1. That your petitioner(s) is (are) the owner(s) of the freehold or lesser estate therein of the premises hereinafter legally described in Exhibit(s) "A", which is attached hereto and made a part hereof by this reference, of is are) a mortgagee or vendee in possession, assignee of rents, receiver, executor (executrix), trustee, lessee or other person, firm or corporation or the duly authorized agents of any of the above persons having proprietary interest in said premises;

2. That your petitioner (s) seek (s) approval of the Final Plat for the subdivision of said premises to be known and described as
The Grove on Kickapoo Creek Sixth Addition

WHEREFORE, your petitioner(s) respectfully pray(s) that said Final Plat for **The Grove on Kickapoo Creek Sixth Addition** submitted herewith be approved with the exemptions or variations as requested herein.

Respectfully submitted,

Eastlake, L.L.C., an Illinois
Limited Liability Company

By: [redacted]
Elizabeth B. Megli, Its Attorney

Exhibit A

Description of Property

Outlot 360 in in The Grove on Kickapoo Creek Third Addition to the City of Bloomington, Illinois, according to the plat recorded as Document No. 2012-19531 in the McLean County Recorder's Office, and a part of the Southeast Quarter of Section 8 and a part of the Southwest Quarter of Section 9, Township 23 North, Range 3 East of the Third Principal Meridian, McLean County, Illinois, more particularly described as follows: Beginning at the Northwest Corner of Lot 25 in The Grove on Kickapoo Creek First Addition to the City of Bloomington, Illinois, according to the plat recorded as Document No. 2007-13421 in the McLean County Recorder's Office, said Northwest Corner being on the West Line of The Grove on Kickapoo Creek Stream Restoration in the City of Bloomington, Illinois, according to the plat recorded as Document No. 2012-19531 in said Recorder's Office. From said Point of Beginning, thence northeast 64.30 feet along said West Line which forms an angle of 111°-04'-26" as measured from west to northeast with the North Line of Lot 26 in said The Grove on Kickapoo Creek First Addition; thence northeast 297.19 feet along said West Line which forms an angle to the right of 180°-26'-47" with the last described course; thence northwest 210.00 feet along a line which forms an angle to the right of 90°-00'-00" with said West Line; thence southwest 11.55 feet along a line which forms an angle to the right of 90°-00'-00" with the last described course; thence northwest 135.50 feet along a line which forms an angle to the right of 272°-15'-05" with the last described course; thence west 147.06 feet along a line which forms an angle to the right of 165°-08'-08" with the last described course; thence west 304.43 feet along the arc of a non-tangential curve concave to the south with a radius of 3110.00 feet and the 304.31 foot chord of said arc forms an angle to the right of 182°-01'-19" with the last described course; thence west 86.01 feet along a line which forms an angle to the right of 173°-11'-23" with the last described chord; thence west 538.16 feet along a line which forms an angle to the right of 179°-09'-23" with the last described course; thence west 60.06 feet along a line which forms an angle to the right of 178°-45'-36" with the last described course; thence west 812.43 feet along a line which forms an angle to the right of 180°-00'-43" with the last described course; thence south 68.15 feet along a line which forms an angle to the right of 87°-26'-19" with the last described course; thence west 123.29 feet along a line which forms an angle to the right of 273°-48'-37" with the last described course; thence north 17.32 feet along a line which forms an angle to the right of 270°-00'-00" with the last described course; thence west 180.00 feet along a line which forms an angle to

the right of 90°-00′-00″ with the last described course to the West Line of the East Half of the Southeast Quarter of Section 8; thence south 258.19 feet along said West Line which forms an angle to the right of 90°-00′-00″ with the last described course to the Northwest Corner of Outlot 360 in The Grove on Kickapoo Creek Third Addition to the City of Bloomington, Illinois, according to the plat recorded as Document No. 2012-19531 in said Recorder's Office; thence southeast 90.68 feet along the North Line of said Outlot 360 which forms an angle to the right of 128°-49′-54″ with the last described course to a Point of Curvature; thence southeasterly 74.43 feet along said North Line being the arc of a curve concave to the north with a radius of 100.00 feet and the 72.72 foot chord of said arc forms an angle to the right of 158°-40′-44″ with the last described course to a Point of Tangency; thence east 1211.35 feet along a line which forms an angle to the right of 158°-40′-44″ with the last described chord to a Point of Curvature; thence easterly 360.80 feet along the arc of a curve concave to the south with a radius of 2780.00 feet and the 360.54 foot chord of said arc forms an angle to the right of 183°-43′-05″ with the last described course to the Northeast Corner of said Outlot 360; thence south 30.06 feet along the East Line of said Outlot 360 which forms an angle to the right of 270°-05′-34″ with the last described chord to the Southeast Corner of said Outlot 360, said Southeast Corner also being the Northwest Corner of Kickapoo Creek Road as dedicated in said The Grove on Kickapoo Creek Third Addition; thence easterly and southeasterly 745.09 feet along the North Line of said Kickapoo Creek Road and the North Lines of Lots 32 through 26, inclusive, in said The Grove on Kickapoo Creek First Addition being the arc of a curve concave to the south with a radius of 2750.00 feet and the 742.82 foot chord of said arc forms an angle to the right of 101°-25′-38″ with the last described course; thence east 23.36 feet along a line which forms an angle to the right of 169°-00′-52″ with the last described chord to the Point of Beginning, containing 21.483 acres, more or less.

SCHOOL DISTRICT CERTIFICATE

This is to certify that **Eastlake, L.L.C., an Illinois Limited Liability Company**, as Developer and Owner of the property herein described in the Surveyor's Certificate, which will be known as The Grove on Kickapoo Creek Sixth Addition, to the best of my knowledge, is located within the boundaries of Community Unit School District #5, in McLean County, Illinois.

Dated this 8th day of July, 2022.

Eastlake, L.L.C., an
Illinois Limited Liability Company

By: [redacted]
Elizabeth B. Megli,
Its Attorney

State of Illinois)
)ss.
County of McLean)

I, Julie L. Garrett, a Notary Public in and for the county and State aforesaid, do hereby certify that ELIZABETH B. MEGLI, personally known to be the same person whose name is subscribed to the foregoing owner's statement, appeared before me, this day, in person and acknowledged the execution of this statement as his free and voluntary act.

Given under my hand and notarial seal this 8th day of July, 2022.

[redacted]
Notary Public

My commission expires 12-7-2022.

"OFFICIAL SEAL"
Julie L. Garrett
Notary Public, State Of Illinois
My Commission Expires 12/07/22

COUNTY CLERK'S CERTIFICATE

State of Illinois)
)ss.
County of McLean)

I, Kathy Michael, County Clerk of McLean County, State of Illinois, do hereby certify that on the 13 day of July, 2022, there were no delinquent general or special assessments unpaid, special assessments or delinquent special assessments unpaid against the tract of land legally described on Exhibit "A" attached hereto and made a part hereof.

Kathy Michael
County Clerk, McLean County, Illinois

22-08-426-031
22-08-426-030
22-08-426-028

OWNER'S CERTIFICATE

STATE OF ILLINOIS)
) SS
COUNTY OF MCLEAN)

KNOW ALL MEN BY THESE PRESENTS, That we, the undersigned, hereby certify that we are the owners of all the premises embodied in the attached plat of The Grove on Kickapoo Creek Sixth Addition, to the City of Bloomington, McLean County, Illinois, and that we have caused said plat to be made and that it is a true and correct final plat of "The Grove on Kickapoo Creek Sixth Addition" to the City of Bloomington, McLean County, Illinois as laid off in lots by Brent A. Bazan, Illinois Professional Land Surveyor Number 3715; and we, the undersigned, hereby dedicate and set apart for the use of the general public forever all of the streets and highways as indicated and shown on said Final Plat; and we further dedicate the easements therein set forth to the City of Bloomington for general utility purposes.

IN WITNESS WHEREOF, we have hereunto set our hands and affixed our seals this 7th day of ~~June~~ July, 2022.

Owner:

Eastlake, L.L.C., an Illinois limited liability company,

By: [redacted]
Thomas Armstrong,
Its President

NOTARY CERTIFICATE

STATE OF ILLINOIS)
) ss.
COUNTY OF MCLEAN)

I, Julie L. Garrett, a Notary Public in and for the county and state aforesaid, do hereby certify that Thomas Armstrong, President of Eastlake, L.L.C., an Illinois limited liability company, personally known to be the President of Eastlake, L.L.C., an Illinois limited liability company, whose name is subscribed to the foregoing Owner's Certificate, appeared before me this day, in person, and acknowledged the execution of this Owner's Certificate as his free and voluntary act, with full power and authority to act, as and on behalf of Eastlake, L.L.C., an Illinois limited liability company.

Given under my hand and notarial seal this 7th day of ~~June~~ July, 2022.

[redacted]
Notary Public

My commission expires 12-7-22.

"OFFICIAL SEAL"
Julie L. Garrett
Notary Public, State Of Illinois
My Commission Expires 12/07/22

Eastlake LLC (The Grove on Kickapoo Creek Sixth Add.)

Date Prepared: 09/16/2022

Shown on Final Plat:		Initial
	Easements shown for all public improvements	SJL
	City Engineer's Signature Block	SJL
	Clerk's Signature Block	SJL
	Areas or facilities to be dedicated to the public	SJL
	Railroad Right of Ways	N/A
	Subdivision Boundaries	SJL
	References to nearest street lines, Township, Sections lines, or monuments.	SJL
	Name of Subdivision	SJL
	Legal Description	SJL
	Existing Parcel Id Number (PIN)	SJL
	Surveyor's statement regarding any Special Flood Hazard Areas.	SJL
	Total Acreage	SJL
	Street Names	SJL
	Proposed Lot numbers (consecutively numbered)	SJL
	Front Yard Setbacks	SJL
The following shall be provided:		
	School District Certificate	SJL
	County Clerk's Certificate	SJL
	Owner's Certificate	SJL
	Drainage Statement	SJL
	Owner's Petition	SJL
	Ordinance	SJL
	Utility Company Signoffs	N/A
	Digital PDF Submittal provided to Public Works	SJL
	Digital CAD format submittal provided to Public Works	Not yet
	2 Mylar Copies	
	12 Paper Copies	
The following requirements shall be met:		
	Final plat retains the design characteristics of a valid Preliminary Plan that has not expired	SJL
	Retains the design characteristics of approved public improvement engineering plans and specifications.	SJL
	Final Plat is signed by IL licensed surveyor	SJL
	Plans for all public improvements approved by Public Works	SJL

City of Bloomington ILLINOIS
Public Works Department

The Grove on Kickapoo Creek Sixth Addition

0 450 900
Feet

Date: 9/21/2022



CITY OF Bloomington ILLINOIS
PUBLIC WORKS DEPARTMENT

115 E. Washington St.
Bloomington, IL 61702-3157
www.cityblm.org/publicworks
Phone: (309) 434-2225
Fax: (309) 434-2201

MEMORANDUM

September 22, 2022

To: Glen Wetterow, City Planner
From: Steven J. Law P.E., Civil Engineer II
Subject: The Grove on Kickapoo Creek Sixth Addition
Performance Guarantees and Tap-On Fees

The following are the Performance Guarantee and Tap On fees required from the developer before releasing for recording the final plat: **The Grove on Kickapoo Creek Sixth Addition**. The final plat will be considered for approval by the City Council at the October 10, 2022 meeting.

A. Performance Guarantee:
$250,000 revolving commercial surety bond covering all additions.

B: Tap-On Fees:

There are tap-on fees due from The Grove on Kickapoo Creek Sixth Addition per the Annexation Agreements dated April 21, 2005 and November 24, 2008.

		Code	***Principal***	***Interest***	***Total***
1	Pump Sta. MBKC San. Sew.	51101100-54120	$43,238.63	$0.00	$43,238.63
2	Force Main MBKC at IGRD	51101100-54120	$21,100.31	$0.00	$21,100.31
3	Brokaw Rd. San. Trunk Sew.	51101100-54120	$18,155.74	$0.00	$18,155.74
4	Water Main	50100110-54120	$0.00	$0.00	$0.00
5	Stormwater Detention	53103100-57320	$0.00	$0.00	$0.00
6	Park Land	24104100-57320	$0.00	$0.00	$0.00
	Total		$82,494.68	$0.00	$82,494.68

- Area: 21.483 acres, 60 Lots
- Sanitary Flow: [(60 Lots X 3.5 pop. X 100 gpd/pop. X 3.0 peaking factor) + (Infiltration: 21.483 acres X 300 gpd/in dia/acre X 8 in.)] / 1,000,000 gpd/mgd = 0.115 MGD
- Ireland Grove Road Frontage: 0 FT

1) Pump Station Main Branch Kickapoo Creek - $375,988.12/mgd
2) Force Main Main Branch Kickapoo Creek - $183,480.96/mgd
3) Sanitary Trunk Sewer Brokaw Road - $157,876.01/mgd
4) Developer to build water main, no tap-on fee.
5) Developer to provide stormwater detention, no tap-on fee.
6) Developer to dedicate park land, no tap-on fee.

C: Guarantee Substandard Street Improvement:

Not Applicable

cc: Kevin Kothe, Director of Public Works
Craig Shonkwiler, City Engineer
Chris Tomerlin
file

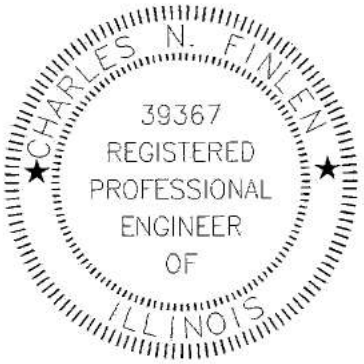
DRAINAGE STATEMENT

I, C. Neil Finlen, Registered Professional Engineer, and Armstrong Builders, Inc., being the owner of the premises heretofore platted by Brent A. Bazan, Illinois Professional Land Surveyor No. 3715, to be and become "The Grove on Kickapoo Creek Sixth Addition" in the City of Bloomington, McLean County, Illinois, do hereby state that to the best of their knowledge and belief, the drainage of surface waters will not be changed by the construction of said Subdivision or any part thereof; or that if such surface waters drainage will be changed, reasonable provision has been made for collection and diversion of such surface waters into public areas or drains which the Subdivider has a right to use and that such waters will be planned for in accordance with generally accepted engineering practices so as to reduce the likelihood of damage to the adjoining property because of the construction of the Subdivision.

I further state that no lots are within the Special Flood Hazard Area, as identified by the Federal Emergency Management Agency.

[redacted]

Registered Professional Engineer No. 039367



OWNER:

BY: [redacted]

CONSENT AGENDA ITEM NO. 7.E

FOR COUNCIL: October 10, 2022

WARD IMPACTED: Ward 3

SUBJECT: Consideration and action to approve an Ordinance approving the Final Plat of the Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision, as requested by the Public Works Department.

RECOMMENDED MOTION: The proposed Ordinance be approved.

STRATEGIC PLAN LINK:
Goal 3. Grow the Local Economy
Goal 5. Great Place - Livable, Sustainable City

STRATEGIC PLAN SIGNIFICANCE:
Objective 3b. Attraction of new targeted businesses that are the "right" fit for Bloomington
Objective 5a. Well-planned City with necessary services and infrastructure
Objective 5b. City decisions consistent with plans and policies

BACKGROUND: The Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision is located between Woodbine Road and Leslie Drive, south of General Electric Road. The proposed final plat facilitates the creation of two commercial lots: one consisting of open space for future development (1.930 acres) and the other currently consisting of infrastructure for Welbrook Bloomington, Assisted Living (5.746 acres). The existing Parcel Identification Number (PIN) for the property is 15-31-227-023.

The zoning in this area is B-1, General Commercial District. The final plat complies with City engineering standards (Manual of Practice and Chapter 24 of City Code). City staff has no objections to the plat.

COMMUNITY GROUPS/INTERESTED PERSONS CONTACTED: Welbrook Bloomington, LLC

FINANCIAL IMPACT: Welbrook Bloomington, LLC, paid all survey and plat costs. No public improvements are being constructed in association with this final plat. Tap-on fees and surety requirements were paid previously at the time of platting the Twelfth Addition to Hawthorne Commercial Subdivision. Approval of the Final Plat will provide a 1.93 acre commercial lot, available for development. This could result in additional property tax revenues for the City.

AMERICAN RESCUE PLAN FUNDING IMPACT: N/A

COMMUNITY DEVELOPMENT IMPACT: **This request meets the following goals and objectives of the Bloomington Comprehensive Plan 2035**: Goal, ED-4.1 (Plan for a diversity of ready-to-build sites to meet the demand), ED-4.2 (Prioritize infill and redevelopment to spur growth and reinvestment in the City), ED-4.4 (Evaluate commercial land use needs in the context of changing economic trends), and UEW-1.2b (Prioritize new

development where City services are available or can be extended efficiently and economically).

Respectfully submitted for consideration.

Prepared by: Steven Law, Civil Engineer II

ATTACHMENTS:
PW 1B ORDINANCE Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision 10102022
PW 1C FINAL PLAT Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision 10102022
PW 1D OWNERS PETITION Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision 10102022
PW 1E COUNTY CLERKS CERTIFICATE Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision 10102022
PW 1F OWNERS CERTIFICATE Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision 10102022
PW 1G SCHOOL DISTRICT CERTIFICATE Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision 10102022
PW 1H FINAL PLAT CHECKLIST Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision 10102022
PW 1I FINAL PLAT MAP Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision 10102022
PW 1J DRAINAGE CERTIFICATE Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision 10102022

ORDINANCE NO. 2022 - _____

AN ORDINANCE APPROVING THE FINAL PLAT OF THE REDIVISION OF LOT 20 OF TWELFTH ADDITION TO HAWTHORNE COMMERCIAL SUBDIVISION

WHEREAS, there was heretofore filed with the City Clerk of the City of Bloomington, McLean County, Illinois, a Petition for approval of the Final Plat of Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision dated August 26, 2022, legally described in Exhibit A attached hereto and made a part hereof by this reference; and

WHEREAS, said Petition requests no exemptions or variations from the provisions of the Bloomington City Code; and

WHEREAS, said Petition is valid and sufficient and conforms to the requirements of the statutes in such cases made and provided and the Final Plat attached to said Petition was prepared in compliance with the requirements of the Bloomington City Code;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF BLOOMINGTON, MCLEAN COUNTY, ILLINOIS:

Section 1. The above recitals are incorporated into and made a part of this Ordinance as though fully set forth herein.

Section 2. The Final Plat of Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision dated August 26, 2022, is hereby approved.

Section 3. This Ordinance is enacted pursuant to the home rule authority of the City of Bloomington granted by Article 7, Section 6 of the 1970 Illinois Constitution.

Section 4. The City Clerk is hereby directed and authorized to publish this Ordinance in pamphlet form as provided by law.

Section 5. This Ordinance shall be effective immediately after its approval and publication as required by law.

PASSED this 10th day of October 2022.

APPROVED this _____ day of October 2022.

CITY OF BLOOMINGTON

_____
Mboka Mwilambwe, Mayor

ATTEST

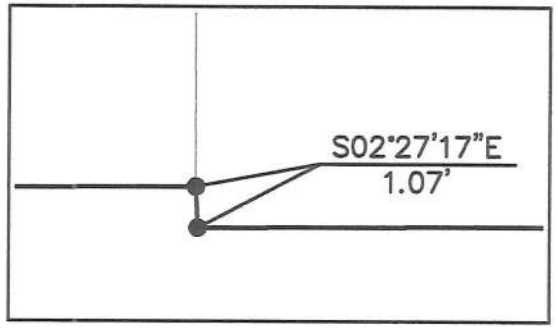
_____
Leslie Smith-Yocum, City Clerk

Exhibit A

Description of Property

Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision recorded as Document Number 2015-00016156 in the Mclean County Recorder's Office being Part of the Northeast Quarter of Section 31, Township 20 North, Range 3 East of the Third Principal Meridian, Bloomington, Mclean County, Illinois more particularly described as follows: Beginning at an iron pin found at the Northeast corner of said Lot 20 in the Twelfth Addition to Hawthorne Commercial Subdivision; thence South 00 degrees 19 minutes 04 seconds East on the West right of way line of Leslie Drive, a distance of 624.20 feet to an iron pin found at the Southeast corner of said Lot 20; thence South 89 degrees 42 minutes 49 seconds West on the South line of said Lot 20, a distance of 545.12 feet to an iron pin found at the Southwest corner of said Lot 20; thence North 00 degrees 17 minutes 56 seconds West on the East right of way line of Woodbine Road, a distance of 573.07 feet to an iron pin found at the beginning of a curve concave the East having a radius of 267.00 feet; thence Northeasterly on said curve right and said East right of way line, a chord bearing of North 01 degrees 51 minutes 28 seconds East, a chord distance of 12.06 feet to an iron pin found at the end of said curve being the Northwest corner of said Lot 20; thence North 89 degrees 24 minutes 38 seconds East on the North line of said Lot 20, a distance of 155.01 feet to an iron pin found; thence North 00 degrees 45 minutes 41 seconds West on said North line, a distance of 39.28 feet to an iron pin found; thence North 89 degrees 40 minutes 42 seconds East on said North line, a distance of 165.84 feet to an iron pin found; thence South 02 degrees 27 minutes 17 seconds East on said North line, a distance of 1.07 feet to an iron pin found; thence North 89 degrees 43 minutes 26 seconds East on said North line, a distance of 223.90 feet to the point of beginning. Containing 334,372.684 square feet (7.676 acres), more or less.

PIN: 15-31-227-023



DETAIL

SCALE: 1" = 5'

NW COR.,
LOT 20

PETITION FOR APPROVAL OF FINAL PLAT

State of Illinois)
)ss.
County of McLean)

TO: THE HONORABLE MAYOR AND CITY COUNCIL OF THE TOWN OF NORMAL, McLEAN COUNTY, ILLINOIS

Now come(s) **Eastlake, L.L.C., an Illinois limited liability company,**

hereinafter referred to as your petitioner(s), respectfully representing and requesting as follows:

1. That your petitioner(s) is (are) the owner(s) of the freehold or lesser estate therein of the premises hereinafter legally described in Exhibit(s) "A", which is attached hereto and made a part hereof by this reference, of is are) a mortgagee or vendee in possession, assignee of rents, receiver, executor (executrix), trustee, lessee or other person, firm or corporation or the duly authorized agents of any of the above persons having proprietary interest in said premises;

2. That your petitioner (s) seek (s) approval of the Final Plat for the subdivision of said premises to be known and described as
The Grove on Kickapoo Creek Sixth Addition

WHEREFORE, your petitioner(s) respectfully pray(s) that said Final Plat for **The Grove on Kickapoo Creek Sixth Addition** submitted herewith be approved with the exemptions or variations as requested herein.

Respectfully submitted,

Eastlake, L.L.C., an Illinois
Limited Liability Company

By: [redacted]
Elizabeth B. Megli, Its Attorney

Exhibit A

Description of Property

Outlot 360 in in The Grove on Kickapoo Creek Third Addition to the City of Bloomington, Illinois, according to the plat recorded as Document No. 2012-19531 in the McLean County Recorder's Office, and a part of the Southeast Quarter of Section 8 and a part of the Southwest Quarter of Section 9, Township 23 North, Range 3 East of the Third Principal Meridian, McLean County, Illinois, more particularly described as follows: Beginning at the Northwest Corner of Lot 25 in The Grove on Kickapoo Creek First Addition to the City of Bloomington, Illinois, according to the plat recorded as Document No. 2007-13421 in the McLean County Recorder's Office, said Northwest Corner being on the West Line of The Grove on Kickapoo Creek Stream Restoration in the City of Bloomington, Illinois, according to the plat recorded as Document No. 2012-19531 in said Recorder's Office. From said Point of Beginning, thence northeast 64.30 feet along said West Line which forms an angle of 111°-04'-26" as measured from west to northeast with the North Line of Lot 26 in said The Grove on Kickapoo Creek First Addition; thence northeast 297.19 feet along said West Line which forms an angle to the right of 180°-26'-47" with the last described course; thence northwest 210.00 feet along a line which forms an angle to the right of 90°-00'-00" with said West Line; thence southwest 11.55 feet along a line which forms an angle to the right of 90°-00'-00" with the last described course; thence northwest 135.50 feet along a line which forms an angle to the right of 272°-15'-05" with the last described course; thence west 147.06 feet along a line which forms an angle to the right of 165°-08'-08" with the last described course; thence west 304.43 feet along the arc of a non-tangential curve concave to the south with a radius of 3110.00 feet and the 304.31 foot chord of said arc forms an angle to the right of 182°-01'-19" with the last described course; thence west 86.01 feet along a line which forms an angle to the right of 173°-11'-23" with the last described chord; thence west 538.16 feet along a line which forms an angle to the right of 179°-09'-23" with the last described course; thence west 60.06 feet along a line which forms an angle to the right of 178°-45'-36" with the last described course; thence west 812.43 feet along a line which forms an angle to the right of 180°-00'-43" with the last described course; thence south 68.15 feet along a line which forms an angle to the right of 87°-26'-19" with the last described course; thence west 123.29 feet along a line which forms an angle to the right of 273°-48'-37" with the last described course; thence north 17.32 feet along a line which forms an angle to the right of 270°-00'-00" with the last described course; thence west 180.00 feet along a line which forms an angle to

the right of 90°-00′-00″ with the last described course to the West Line of the East Half of the Southeast Quarter of Section 8; thence south 258.19 feet along said West Line which forms an angle to the right of 90°-00′-00″ with the last described course to the Northwest Corner of Outlot 360 in The Grove on Kickapoo Creek Third Addition to the City of Bloomington, Illinois, according to the plat recorded as Document No. 2012-19531 in said Recorder's Office; thence southeast 90.68 feet along the North Line of said Outlot 360 which forms an angle to the right of 128°-49′-54″ with the last described course to a Point of Curvature; thence southeasterly 74.43 feet along said North Line being the arc of a curve concave to the north with a radius of 100.00 feet and the 72.72 foot chord of said arc forms an angle to the right of 158°-40′-44″ with the last described course to a Point of Tangency; thence east 1211.35 feet along a line which forms an angle to the right of 158°-40′-44″ with the last described chord to a Point of Curvature; thence easterly 360.80 feet along the arc of a curve concave to the south with a radius of 2780.00 feet and the 360.54 foot chord of said arc forms an angle to the right of 183°-43′-05″ with the last described course to the Northeast Corner of said Outlot 360; thence south 30.06 feet along the East Line of said Outlot 360 which forms an angle to the right of 270°-05′-34″ with the last described chord to the Southeast Corner of said Outlot 360, said Southeast Corner also being the Northwest Corner of Kickapoo Creek Road as dedicated in said The Grove on Kickapoo Creek Third Addition; thence easterly and southeasterly 745.09 feet along the North Line of said Kickapoo Creek Road and the North Lines of Lots 32 through 26, inclusive, in said The Grove on Kickapoo Creek First Addition being the arc of a curve concave to the south with a radius of 2750.00 feet and the 742.82 foot chord of said arc forms an angle to the right of 101°-25′-38″ with the last described course; thence east 23.36 feet along a line which forms an angle to the right of 169°-00′-52″ with the last described chord to the Point of Beginning, containing 21.483 acres, more or less.

COUNTY CLERK'S CERTIFICATE

STATE OF ILLINOIS)
) SS.
COUNTY OF McLEAN)

I, Kathy Michael, County Clerk of McLean County, State of Illinois, do hereby certify that I have this day examined the tax records of the property shown on the attached plat and find no delinquent general taxes, unpaid current general taxes, delinquent special assessments, or unpaid current special assessments against the tract of land described in said plat, given under my hand and seal of this County on the 15th day of September 2022.

15-31-227-023

Kathy Michael

Kathy Michael, County Clerk
McLean County, Illinois

OWNER'S CERTIFICATE

State of Illinois)
)ss.
County of McLean)

KNOW ALL MEN BY THESE PRESENTS, That we, the undersigned, hereby certify that we are the owners of all the premises embodied in the attached Plat of REDIVISION OF LOT 20 OF TWELFTH ADDITION TO HAWTHORNE COMMERCIAL SUBDIVISION to the City of Bloomington, McLean County, Illinois, and that we have caused said Plat to be made and that it is a true and correct plat of "REDIVISION OF LOT 20 OF TWELFTH ADDITION TO HAWTHORNE COMMERCIAL SUBDIVISION" to the City of Bloomington, McLean County, Illinois as laid off in lots and streets by Jeremy L. Smith Registered Illinois Land Surveyor Number 3804; and we, the undersigned, hereby dedicate and set apart to the City of Bloomington for general utility purposes, (and further dedicated the public use areas as shown on said Plat)*.

IN WITNESS WHEREOF, we have hereunto set our hands and affixed our seals this 4 day of ~~August~~ Sept, 2022.

*where dedication is required under Section 3.5.

(Seal)

[redacted]
Owner Signature

Owner Signature

State of Illinois)
)ss.
County of McLean)

Official Seal
Kathy Erickson
Notary Public State of Illinois
My Commission Expires 5/3/2026

I, Kathy Erickson, a Notary Public in and for the county and State aforesaid, do hereby certify that Carrie Bentley personally known to be the same person whose name is subscribed to the foregoing owner's statement, appeared before me, this day, in person and acknowledged the execution of this statement as his free and voluntary act.

Given under my hand and notarial seal this 4th day of September, 2022.

[redacted]
Notary Public

My commission expires 5/3/2026.

SCHOOL DISTRICT CERTIFICATE

This is to certify that I Carrie Bentley as Owner/Developer of the property herein described in the Surveyor's Certificate, which will be known as REDIVISION OF LOT 20 OF TWELFTH ADDITION TO HAWTHORNE COMMERCIAL SUBDIVISION, to the best of my knowledge, is located within the boundaries of Community School District #_____ in McLean County, Illinois.

Dated this 4th day of Sept., 2022.

[redacted]

Owner/Developer

State of Illinois)
)ss.
County of McLean)

I, Kathy Erickson, a Notary Public in and for the county and State aforesaid, do hereby certify that Carrie Bentley personally known to be the same person whose name is subscribed to the foregoing owner's statement, appeared before me, this day, in person and acknowledged the execution of this statement as his free and voluntary act.

Given under my hand and notarial seal this 4th day of September, 2022.

[redacted]

Notary Public

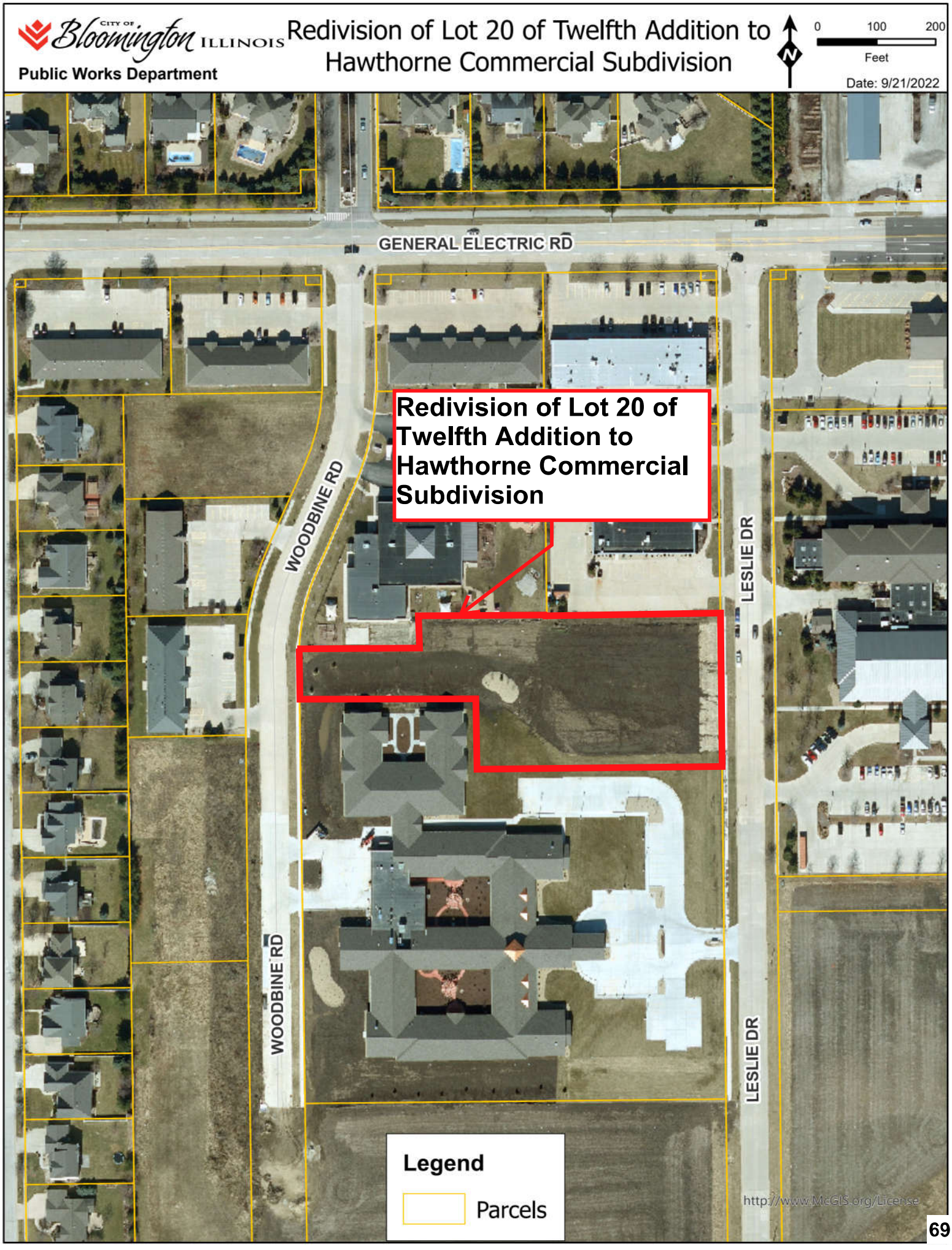
My commission expires 5/3/2026.

Official Seal
Kathy Erickson
Notary Public State of Illinois
My Commission Expires 5/3/2026

Welbrook Bloomington LLC (Redivision of Lot 20 of 12th Add. To Hawthorne Comm. Sub.)

Date Prepared: 09/16/2022

Shown on Final Plat:		Initial
	Easements shown for all public improvements	SJL
	City Engineer's Signature Block	SJL
	Clerk's Signature Block	SJL
	Areas or facilities to be dedicated to the public	SJL
	Railroad Right of Ways	N/A
	Subdivision Boundaries	SJL
	References to nearest street lines, Township, Sections lines, or monuments.	SJL
	Name of Subdivision	SJL
	Legal Description	SJL
	Existing Parcel Id Number (PIN)	SJL
	Surveyor's statement regarding any Special Flood Hazard Areas.	SJL
	Total Acreage	SJL
	Street Names	SJL
	Proposed Lot numbers (consecutively numbered)	SJL
	Front Yard Setbacks	-
The following shall be provided:		
	School District Certificate	SJL
	County Clerk's Certificate	SJL
	Owner's Certificate	SJL
	Drainage Statement	SJL
	Owner's Petition	SJL
	Ordinance	SJL
	Utility Company Signoffs	N/A
	Digital PDF Submittal provided to Public Works	SJL
	Digital CAD format submittal provided to Public Works	Not yet
	2 Mylar Copies	
	12 Paper Copies	
The following requirements shall be met:		
	Final plat retains the design characteristics of a valid Preliminary Plan that has not expired	SJL
	Retains the design characteristics of approved public improvement engineering plans and specifications.	SJL
	Final Plat is signed by IL licensed surveyor	SJL
	Plans for all public improvements approved by Public Works	SJL


City of Bloomington Illinois
Public Works Department
Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision
0 100 200
Feet
Date: 9/21/2022
GENERAL ELECTRIC RD
WOODBINE RD
WOODBINE RD
LESLIE DR
LESLIE DR
Redivision of Lot 20 of Twelfth Addition to Hawthorne Commercial Subdivision
Legend
Parcels
http://www.McGIS.org/License

DRAINAGE CERTIFICATE

Whereas the surface water drainage will not be changed by the filing of **REDIVISION OF LOT 20 OF TWELFTH ADDITION TO HAWTHORNE COMMERCIAL SUBDIVISION**, and to the best of our knowledge and belief, adequate provisions have previously been made for collection and diversion of such surface waters into public areas or drains which the subdivider still has a right to use, in accordance with generally accepted engineering practices, and that there will be no change in such surface waters because of this subdivision.

[redacted] 9-13-22

Illinois Professional Engineer No. 68868
Tyler K. Walker



CONSENT AGENDA ITEM NO. 7.F

FOR COUNCIL: October 10, 2022

WARD IMPACTED: Ward 2

SUBJECT: Consideration and action to approve an Ordinance approving the Final Plat of Third Addition to Cedar Ridge Subdivision, subject to the petitioner providing the required sureties and tap-on fees, as requested by the Public Works Department.

RECOMMENDED MOTION: The proposed Ordinance be approved, subject to the petitioner providing the required sureties and tap-on fees.

STRATEGIC PLAN LINK:
Goal 4. Strong Neighborhoods
Goal 5. Great Place - Livable, Sustainable City

STRATEGIC PLAN SIGNIFICANCE:
Objective 4c. Preservation of property/home valuations
Objective 5a. Well-planned City with necessary services and infrastructure
Objective 5b. City decisions consistent with plans and policies

BACKGROUND: The Third Addition to Cedar Ridge Subdivision is located south of Cedar Ridge Elementary school and just north of Interstate 74. The proposed Final Plat facilitates the creation of 42 residential lots. The lot configuration is consistent with the subdivision's Amended and Reinstated Preliminary Plan approved by Council on September 28, 2015 and subsequently amended on May 23, 2022. The existing Parcel Identification Numbers (PIN) for the property are 21-21-276-006 and 21-21-255-010.

The zoning in this area is R-1C, Single-Family Residence District. Approval of this Final Plat will facilitate new residences. The proposed use is permitted in this zoning district. The Final Plat complies with City engineering standards (Manual of Practice and Chapter 24 of City Code). City staff has no objections to the plat.

COMMUNITY GROUPS/INTERESTED PERSONS CONTACTED: Cedar Ridge, LLC

FINANCIAL IMPACT: Cedar Ridge, LLC, paid all survey and plat costs. Tap-on fees are required and the surety requirement is met with a $200,000 revolving bond. See tap-on/surety attachment for additional information. Approval of the Final Plat will facilitate the construction of new residential housing. This could result in additional property tax revenues for the City.

AMERICAN RESCUE PLAN FUNDING IMPACT: N/A

COMMUNITY DEVELOPMENT IMPACT: **This request meets the following goals and objectives of the Bloomington Comprehensive Plan 2035**: Goal, H-1. Ensure the availability of safe, attractive and high-quality housing stock to meet the needs of all

current and future residents of Bloomington. Objective, H-1.1 Ensure that the housing to accommodate the new growth is a broad range (of types, sizes, ages, densities, tenancies and costs) equitably distributed throughout the City recognizing changing trends in age-group composition, income, and family living habits. Objective UEW-1.2b Prioritize new development where City services are available or can be extended efficiently and economically.

Respectfully submitted for consideration.

Prepared by: Steven Law, Civil Engineer II

ATTACHMENTS:
PW 1B ORDINANCE Third Addition to Cedar Ridge Subdivision 10102022
PW 1C FINAL PLAT Third Addition to Cedar Ridge Subdivision 10102022
PW 1D OWNERS PETITION Third Addition to Cedar Ridge Subdivision 10102022
PW 1E COUNTY CLERKS CERTIFICATE Third Addition to Cedar Ridge Subdivision 10102022
PW 1F OWNERS CERTIFICATE Third Addition to Cedar Ridge Subdivision 10102022
PW 1G SCHOOL DISTRICT CERTIFICATE Third Addition to Cedar Ridge Subdivision 10102022
PW 1H FINAL PLAT CHECKLIST Third Addition to Cedar Ridge Subdivision 10102022
PW 1I FINAL PLAT MAP Third Addition to Cedar Ridge Subdivision 10102022
PW 1J TAP ON MEMO Third Addition to Cedar Ridge Subdivision 10102022
PW 1K DRAINAGE STATEMENT Third Addition to Cedar Ridge Subdivision 10102022

ORDINANCE NO. 2022 - _____

AN ORDINANCE APPROVING THE FINAL PLAT OF THIRD ADDITION TO CEDAR RIDGE SUBDIVISION

WHEREAS, there was heretofore filed with the City Clerk of the City of Bloomington, McLean County, Illinois, a Petition for approval of the Final Plat of Third Addition to Cedar Ridge Subdivision dated September 26, 2022, legally described in Exhibit A attached hereto and made a part hereof by this reference; and

WHEREAS, said Petition requests no exemptions or variations from the provisions of the Bloomington City Code; and

WHEREAS, said Petition is valid and sufficient and conforms to the requirements of the statutes in such cases made and provided and the Final Plat attached to said Petition was prepared in compliance with the requirements of the Bloomington City Code;

WHEREAS, the proposed final plat's lot configuration is consistent with the subdivision's amended and reinstated preliminary plan amended by Council on May 23, 2022 and said preliminary plan has therefore been extended by action of the City Council within the meaning of Chapter 24, Section 3.2.9 of the Bloomington City Code.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF BLOOMINGTON, MCLEAN COUNTY, ILLINOIS:

Section 1. The above recitals are incorporated into and made a part of this Ordinance as though fully set forth herein.

Section 2. The Final Plat of Third Addition to Cedar Ridge Subdivision dated September 26, 2022, is hereby approved.

Section 3. This Ordinance is enacted pursuant to the home rule authority of the City of Bloomington granted by Article 7, Section 6 of the 1970 Illinois Constitution.

Section 4. The City Clerk is hereby directed and authorized to publish this Ordinance in pamphlet form as provided by law.

Section 5. This Ordinance shall be effective immediately after its approval and publication as required by law.

PASSED this 10th day of October 2022.

APPROVED this _____ day of October 2022.

CITY OF BLOOMINGTON

_____
Mboka Mwilambwe, Mayor

ATTEST

_____
Leslie Smith-Yocum, City Clerk

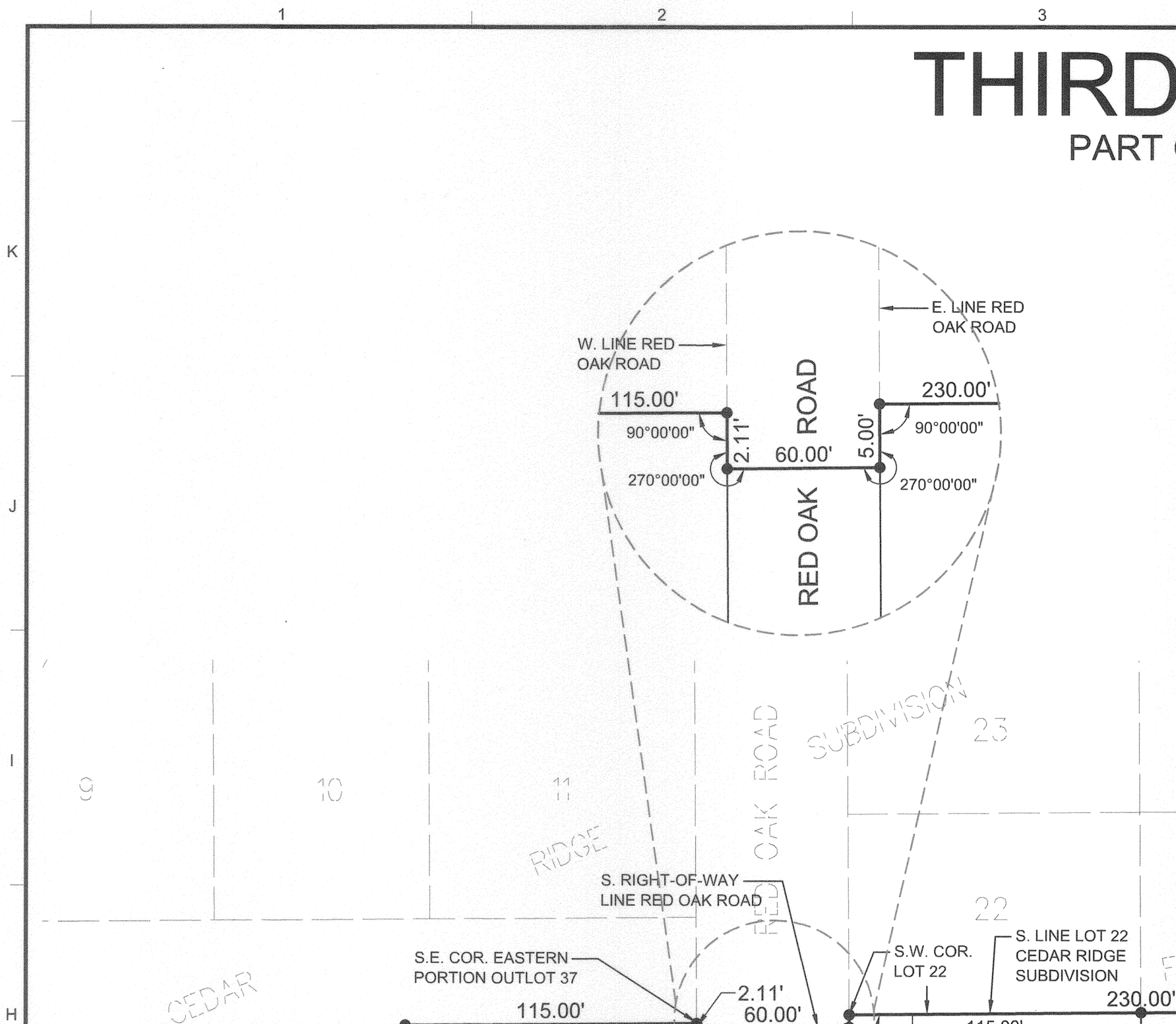
Exhibit A

Cedar Ridge 3rd Addition Description

A part of the East Half of Section 21, Township 23 North, Range 2 East of the Third Principal Meridian, McLean County, Illinois, more particularly described as follows: Beginning at the Southeast Corner of Lot 53 in the First Addition to Cedar Ridge Subdivision in the City of Bloomington, Illinois, according to the plat recorded as Document No. 2008-25575 in the McLean County Recorder's Office. From said Point of Beginning, thence west 110.00 feet along the South Line of said Lot 53 to the Southwest Corner thereof, being on the East Line of Conlor Drive in said First Addition; thence south 3.00 feet along said East Line of Conlor Drive which forms an angle to the right of 90°-00'-00" with the last described course to the Southeast Corner thereof; thence west 350.00 feet along the South Line of said Conlor Drive, and the South Lines of Lot 54, Lot 69 and Bardwell Road in said First Addition which form an angle to the right of 270°-00'-00" with the last described course to the Southwest Corner of said Bardwell Road; thence north 5.00 feet along the West Line of Bardwell Road which forms an angle to the right of 270°-00'-00" with the last described course to the Southeast Corner of Lot 70 in said First Addition; thence west 230.00 feet along the South Line of said Lot 70 and the South Line of Lot 22 in Cedar Ridge Subdivision in the City of Bloomington, Illinois, according to the plat recorded as Document No. 2008-1507 in said Recorder's Office which form an angle to the right of 90°-00'-00" with the last described course to the Southwest Corner of said Lot 22, being on the East Line of Red Oak Road in said Cedar Ridge Subdivision; thence south 5.00 feet along said East Line which forms an angle to the right of 90°-00'-00" with the last described course to the Southeast Corner of said Red Oak Road; thence west 60.00 feet along the South Line of said Red Oak Road which forms an angle to the right of 270°-00'-00" with the last described course to the Southwest Corner thereof; thence north 2.11 feet along the West Line of said Red Oak Road which forms an angle to the right of 270°-00'-00" with the last described course to the Southeast Corner of the Eastern Portion of Outlot 37 in said Cedar Ridge Subdivision; thence west 115.00 feet along the South Line of said Eastern Portion which forms an angle to the right of 90°-00'-00" with the last described course to the Southwest Corner of the Eastern Portion of said Outlot 37; thence south 526.21 feet along East Line of said Outlot 37 which forms an angle to the right of 90°-00'-00" with the last described course to the Southeast Corner of said Outlot 37, being on the Northerly Right-of-Way Line of F.A.I. Route 05-Section 57-20 (Interstate 74) as shown in Plat Book 14, Page 138, in said Recorder's Office; thence southeast 108.98 feet along said Northerly

Right-of-Way Line which forms an angle to the right of 109°-34′-45″ with the last described course; thence east 760.94 feet along said Northerly Right-of-Way Line which forms an angle to the right of 161°-14′-39″ with the last described course; thence north 142.56 feet along a line which forms an angle to the right of 89°-10′-36″ with the last described course; thence east 1.46 feet along line which forms an angle to the right of 270°-00′-00″ with the last described course to a point in the Southerly Extension of the East Line of said First Addition to Cedar Ridge Subdivision; thence north 432.00 feet along said Southerly Extension which forms an angle to the right of 90°-00′-00″ with the last described course to the Point of Beginning, containing 11.220 acres, more or less.

PINS: 21-21-276-006, 21-21-255-010


1
2
3
K
J
I
H
THIRD
PART
E. LINE RED
OAK ROAD
W. LINE RED
OAK ROAD
115.00'
90°00'00"
2.11'
RED OAK ROAD
60.00'
5.00'
230.00'
90°00'00"
270°00'00"
270°00'00"
RED OAK ROAD
SUBDIVISION
23
9
10
11
RIDGE
S. RIGHT-OF-WAY
LINE RED OAK ROAD
22
S.E. COR. EASTERN
PORTION OUTLOT 37
S.W. COR.
LOT 22
S. LINE LOT 22
CEDAR RIDGE
SUBDIVISION
CEDAR
2.11'
115.00'
60.00'
230.00'

PETITION FOR APPROVAL OF FINAL PLAT

State of Illinois)
)ss.
County of McLean)

TO: THE HONORABLE MAYOR AND CITY COUNCIL OF THE CITY OF BLOOMINGTON, MCLEAN COUNTY, ILLINOIS

Now comes Cedar Ridge, LLC, hereinafter referred to as your petitioners, respectfully representing and requesting as follows:

1. That your petitioner is the owners of the freehold or lesser estate therein of the premises hereinafter legally described in Exhibit A which is attached hereto and made a part hereof by this reference, is a mortgagee or vendee in possession, assignee of rents, receiver, executor (executrix), trustee, lessee or other person, firm or corporation or the duly authorized agents of any of the above persons having proprietary interest in said premises;

2. That your petitioner seeks approval of the Final Plat for the subdivision of said premises to be known and described as the "Third Addition to Cedar Ridge Subdivision".

3. That your petitioner also seeks approval of the following exemptions or variations from the provisions of Chapter 24 of the Bloomington City Code, 1960: None

WHEREFORE, your petitioner respectfully prays that said Final Plat for the Third Addition to Cedar Ridge Subdivision submitted herewith be approved with the exemptions or variations as requested herein.

Respectfully submitted,

By: [redacted]

Printed Name: David W. Fox

Title: Owner

Exhibit A

A part of the East Half of Section 21, Township 23 North, Range 2 East of the Third Principal Meridian, McLean County, Illinois, more particularly described as follows: Beginning at the Southeast Corner of Lot 53 in the First Addition to Cedar Ridge Subdivision in the City of Bloomington, Illinois, according to the plat recorded as Document No. 2008-25575 in the McLean County Recorder's Office. From said Point of Beginning, thence west 110.00 feet along the South Line of said Lot 53 to the Southwest Corner thereof, being on the East Line of Conlor Drive in said First Addition; thence south 3.00 feet along said East Line of Conlor Drive which forms an angle to the right of 90°-00'-00" with the last described course to the Southeast Corner thereof; thence west 350.00 feet along the South Line of said Conlor Drive, and the South Lines of Lot 54, Lot 69 and Bardwell Road in said First Addition which form an angle to the right of 270°-00'-00" with the last described course to the Southwest Corner of said Bardwell Road; thence north 5.00 feet along the West Line of Bardwell Road which forms an angle to the right of 270°-00'-00" with the last described course to the Southeast Corner of Lot 70 in said First Addition; thence west 230.00 feet along the South Line of said Lot 70 and the South Line of Lot 22 in Cedar Ridge Subdivision in the City of Bloomington, Illinois, according to the plat recorded as Document No. 2008-1507 in said Recorder's Office which form an angle to the right of 90°-00'-00" with the last described course to the Southwest Corner of said Lot 22, being on the East Line of Red Oak Road in said Cedar Ridge Subdivision; thence south 5.00 feet along said East Line which forms an angle to the right of 90°-00'-00" with the last described course to the Southeast Corner of said Red Oak Road; thence west 60.00 feet along the South Line of said Red Oak Road which forms an angle to the right of 270°-00'-00" with the last described course to the Southwest Corner thereof; thence north 2.11 feet along the West Line of said Red Oak Road which forms an angle to the right of 270°-00'-00" with the last described course to the Southeast Corner of the Eastern Portion of Outlot 37 in said Cedar Ridge Subdivision; thence west 115.00 feet along the South Line of said Eastern Portion which forms an angle to the right of 90°-00'-00" with the last described course to the Southwest Corner of the Eastern Portion of said Outlot 37; thence south 526.21 feet along East Line of said Outlot 37 which forms an angle to the right of 90°-00'-00" with the last described course to the Southeast Corner of said Outlot 37, being on the Northerly Right-of-Way Line of F.A.I. Route 05-Section 57-20 (Interstate 74) as shown in Plat Book 14, Page 138, in said Recorder's Office; thence southeast 108.98 feet along said Northerly Right-of-Way Line which forms an angle to the right of 109°-34'-45" with the last described course; thence east 760.94 feet along said Northerly Right-of-Way Line which forms an angle to the right of 161°-14'-39" with the last described course; thence north 142.56 feet along a line which forms an angle to the right of 89°-10'-36" with the

last described course; thence east 1.46 feet along line which forms an angle to the right of 270°-00'-00" with the last described course to a point in the Southerly Extension of the East Line of said First Addition to Cedar Ridge Subdivision; thence north 432.00 feet along said Southerly Extension which forms an angle to the right of 90°-00'-00" with the last described course to the Point of Beginning, containing 11.220 acres, more or less.

COUNTY CLERK'S CERTIFICATE

State of Illinois)
)ss.
County of McLean)

I, Kathy Michael, County Clerk of McLean County, State of Illinois, do hereby certify that on the 12 day of July, 2022, there were no delinquent general or special assessments unpaid, special assessments or delinquent special assessments unpaid against the tracts of land shown on the plat attached to this certificate and described in the certificate of the Surveyor attached hereto and to said Plat.

Kathy Michael

Kathy Michael
County Clerk, McLean County, Illinois

PIN 21-21-276-006 and 21-21-255-010

OWNER'S CERTIFICATE

State of Illinois)
)ss.
County of McLean)

KNOW ALL MEN BY THESE PRESENTS, That we, the undersigned, hereby certify that we are the owners of all the premises embodied in the attached Plat of the "Third Addition to Cedar Ridge Subdivision" in the City of Bloomington, McLean County, Illinois, and that we have caused said Plat to be made and that it is a true and correct plat of the "Third Addition to Cedar Ridge Subdivision" in the City of Bloomington, McLean County, Illinois as laid off in lots by Brent Bazan, Illinois Professional Land Surveyor Number 3715; and we, the undersigned, hereby dedicate and set apart to the City of Bloomington for general utility purposes.

IN WITNESS WHEREOF, we have hereunto set our hands and affixed our seals this 26th day of August, 2022.

Owner: Cedar Ridge, LLC

[redacted]

NOTARY CERTIFICATE

State of Illinois)
)ss.
County of McLean)

I, EDITH C VOEGELE, a Notary Public in and for the county and State aforesaid, do hereby certify that DAVID W FEDOR personally known to be the same person whose name is subscribed to the foregoing owner's statement, appeared before me, this day, in person and acknowledged the execution of this statement as his free and voluntary act.

Given under my hand and notarial seal this 26 day of AUGUST, 2022.

[redacted]

Notary Public

My commission expires DECEMBER 13, 2025.

EDITH C VOEGELE
OFFICIAL SEAL
Notary Public - State of Illinois
My Commission Expires
December 13, 2025

SCHOOL DISTRICT CERTIFICATE

This is to certify that Cedar Ridge, LLC as Owner/Developer of the property herein described in the Surveyor's Certificate, which will be known as the "Third Addition to Cedar Ridge Subdivision", to the best of my knowledge, is located within the boundaries of Community Unit School District #5 in McLean County, Illinois.

Dated this 26th day of August, 2022.

[redacted]

Owner/Developer

NOTARY CERTIFICATE

State of Illinois)
)ss.
County of McLean)

I, EDITH VOEGELE, a Notary Public in and for the county and State aforesaid, do hereby certify that DAVID V. FEDOR personally known to be the same person whose name is subscribed to the foregoing owner's statement, appeared before me, this day, in person and acknowledged the execution of this statement as his free and voluntary act.

Given under my hand and notarial seal this 26 day of AUGUST, 2022.

[redacted]

Notary Public

My commission expires DECEMBER 13, 2025.

EDITH C VOEGELE
OFFICIAL SEAL
Notary Public - State of Illinois
My Commission Expires
December 13, 2025

Cedar Ridge, LLC (Third Addition to Cedar Ridge Subdivision)

Date Prepared: 09/22/2022

Shown on Final Plat:		Initial
	Easements shown for all public improvements	SJL
	City Engineer's Signature Block	SJL
	Clerk's Signature Block	SJL
	Areas or facilities to be dedicated to the public	SJL
	Railroad Right of Ways	N/A
	Subdivision Boundaries	SJL
	References to nearest street lines, Township, Sections lines, or monuments.	SJL
	Name of Subdivision	SJL
	Legal Description	SJL
	Existing Parcel Id Number (PIN)	SJL
	Surveyor's statement regarding any Special Flood Hazard Areas.	SJL
	Total Acreage	SJL
	Street Names	SJL
	Proposed Lot numbers (consecutively numbered)	SJL
	Front Yard Setbacks	SJL
The following shall be provided:		
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	County Clerk's Certificate	SJL
	Owner's Certificate	SJL
	Drainage Statement	SJL
	Owner's Petition	SJL
	Ordinance	SJL
	Utility Company Signoffs	N/A
	Digital PDF Submittal provided to Public Works	SJL
	Digital CAD format submittal provided to Public Works	Not yet
	2 Mylar Copies	
	12 Paper Copies	
The following requirements shall be met:		
	Final plat retains the design characteristics of a valid Preliminary Plan that has not expired	SJL
	Retains the design characteristics of approved public improvement engineering plans and specifications.	SJL
	Final Plat is signed by IL licensed surveyor	SJL
	Plans for all public improvements approved by Public Works	SJL

City of Bloomington ILLINOIS
Public Works Department

Third Addition to Cedar Ridge Subdivision

0 100 200
Feet
Date: 9/21/2022



CITY OF Bloomington ILLINOIS
PUBLIC WORKS DEPARTMENT

115 E. Washington St.
Bloomington, IL 61702-3157
www.cityblm.org/publicworks
Phone: (309) 434-2225
Fax: (309) 434-2201

MEMORANDUM

September 16, 2022

To: Glen Wetterow, City Planner
From: Steven J. Law P.E., Civil Engineer II
Subject: Third Addition to Cedar Ridge Subdivision
Performance Guarantees and Tap-On Fees

The following are the Performance Guarantee and Tap On fees required from the developer before releasing for recording the final plat: **Third Addition to Cedar Ridge Subdivision**. The final plat will be considered for approval by the City Council at the October 10, 2022 meeting.

A. Performance Guarantee:
$200,000 revolving commercial surety bond covering all additions.

B: Tap-On Fees:

The following tap-on fees are due per the June 12, 2006 Annexation Agreement with Cedar Ridge, LLC.

		Code	***Principal***	***Interest***	***Total***
1	Cedar Ridge Outfall Sewer	51101100-54120	$13,766.94	$5,549.75	$19,316.69
2	Woodrig Road Water Main	50100120-57320	$0.00	$0.00	$0.00
3	Stormwater Detention	24104100-57320	$0.00	$0.00	$0.00
4	Parkland Dedication	24104100-57320	$0.00	$0.00	$0.00
	Total		$13,766.94	$5,549.75	$19,316.69

Area: 11.22 acres, 42 Lots

1) Cedar Ridge Outfall Sewer: $1,227/ac. + 6% interest from Jan 2008**(Used CPI Interest)
2) Woodrig Road Water Main: none, no frontage on Woodrig Road for this addition.
3) Stormwater Detention: none, provided onsite.
4) Parkland Dedication Fee: none, land dedicated for park south of Cedar Ridge Elementary

** Interest calculated based on the lower of 6% simple interest of the CPI calculated on the principal using the BLS inflation calculator at https://www.bls.gov/data/inflation_calculator.htm

C: Guarantee Substandard Street Improvement:

Not Applicable

cc: Kevin Kothe, Director of Public Works
Craig Shonkwiler, City Engineer
Chris Tomerlin
file

DRAINAGE STATEMENT

I, C. Neil Finlen, Registered Professional Engineer, and Cedar Ridge, LLC, being the owner of the premises heretofore platted by Brent A. Bazan, Illinois Professional Land Surveyor No. 3715, to be and become the "Third Addition to Cedar Ridge Subdivision" in the City of Bloomington, McLean County, Illinois, do hereby state that to the best of their knowledge and belief, the drainage of surface waters will not be changed by the construction of said Subdivision or any part thereof; or that if such surface waters drainage will be changed, reasonable provision has been made for collection and diversion of such surface waters into public areas or drains which the Subdivider has a right to use and that such waters will be planned for in accordance with generally accepted engineering practices so as to reduce the likelihood of damage to the adjoining property because of the construction of the Subdivision.

I further state that no lots are within the Special Flood Hazard Area, as identified by the Federal Emergency Management Agency.

[redacted]

Registered Professional Engineer No. 039367



OWNER:

BY: _____

CONSENT AGENDA ITEM NO. 7.G

FOR COUNCIL: October 10, 2022

WARD IMPACTED: City-Wide Impact

SUBJECT: Consideration and action on an Ordinance approving the Final Plat of Route 51 Subdivision Second Addition, as requested by the Public Works Department.

RECOMMENDED MOTION: The proposed Ordinance be approved.

STRATEGIC PLAN LINK:
Goal 5. Great Place - Livable, Sustainable City

STRATEGIC PLAN SIGNIFICANCE:
Objective 5b. City decisions consistent with plans and policies

BACKGROUND: The proposed Ordinance is for the Final Plat of Route 51 Subdivision Second Addition, which consists of one lot and is located south of 925 North Road and east of US Route 51. The existing Parcel Identification Number (PIN) for the property is 21-28-400-002. This parcel is less than 1.5 miles outside of the Corporate Limits of the City of Bloomington. Therefore, the Plat falls within the City's extraterritorial jurisdiction for review and approval. The land depicted on the Plat is not identified in the Bloomington Comprehensive Plan Future Land Use map. It does not have access to City utilities and no development is expected to occur soon. The proposed Plat complies with the City of Bloomington minimum lot widths and minimum lot areas, as well as easement dedication requirements. Road access has been approved by the Township Highway Commissioner.

Zoning and future use will be approved by the McLean County Building and Zoning Department. The Final Plat complies with City engineering standards (Manual of Practice and Chapter 24 of City Code). City staff has no objections to the plat.

COMMUNITY GROUPS/INTERESTED PERSONS CONTACTED: Growmark, Inc.

FINANCIAL IMPACT: Growmark, Inc. paid all survey and plat costs.

AMERICAN RESCUE PLAN FUNDING IMPACT: N/A

COMMUNITY DEVELOPMENT IMPACT: **This request meets the following goals and objectives of the Bloomington Comprehensive Plan 2035**: N/A

Respectfully submitted for consideration.

Prepared by: Steven Law, Civil Engineer II

ATTACHMENTS:
PW_1B_ORDINANCE_Route_51_Subdivision_Second_Addition_10102022.doc
PW 1C FINAL PLAT Route 51 Subdivision Second Addition 10102022

PW 1D OWNERS PETITION Route 51 Subdivision Second Addition 10102022
PW 1E COUNTY CLERKS CERTIFICATE Route 51 Subdivision Second Addition 10102022
PW 1F OWNERS CERTIFICATE Route 51 Subdivision Second Addition 10102022
PW 1G SCHOOL DISTRICT CERTIFICATE Route 51 Subdivision Second Addition 10102022
PW 1H FINAL PLAT CHECKLIST Route 51 Subdivision Second Addition 10102022
PW 1I FINAL PLAT MAP Route 51 Subdivision Second Addition 10102022
PW 1J DRAINAGE STATEMENT Route 51 Subdivision Second Addition 10102022
PW 1K TOWNSHIP HIGHWAY COMMISSIONER PLAT ACCESS CERTIFICATE Route 51 Subdivision Second Addition 10102022

ORDINANCE NO. 2022 - _____

AN ORDINANCE APPROVING THE FINAL PLAT OF ROUTE 51 SUBDIVISION SECOND ADDITION

WHEREAS, there was heretofore filed with the City Clerk of the City of Bloomington, McLean County, Illinois, a Petition for approval of the Final Plat of Route 51 Subdivision Second Addition dated September 23, 2022, legally described in Exhibit A attached hereto and made a part hereof by this reference; and

WHEREAS, said Petition requests no exemptions or variations from the provisions of the Bloomington City Code; and

WHEREAS, said Petition is valid and sufficient and conforms to the requirements of the statutes in such cases made and provided and the Final Plat attached to said Petition was prepared in compliance with the requirements of the Bloomington City Code;

WHEREAS, the submitted final plat qualifies for the expedited final plat procedure set forth in Chapter 24, Section 3.5.6. of the Bloomington City Code.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF BLOOMINGTON, MCLEAN COUNTY, ILLINOIS:

Section 1. The above recitals are incorporated into and made a part of this Ordinance as though fully set forth herein.

Section 2. The Final Plat of Route 51 Subdivision Second Addition dated September 23, 2022, is hereby approved.

Section 3. This Ordinance is enacted pursuant to the home rule authority of the City of Bloomington granted by Article 7, Section 6 of the 1970 Illinois Constitution.

Section 4. The City Clerk is hereby directed and authorized to publish this Ordinance in pamphlet form as provided by law.

Section 5. This Ordinance shall be effective immediately after its approval and publication as required by law.

PASSED this 10th day of October 2022.

APPROVED this _____ day of October 2022.

CITY OF BLOOMINGTON

_____
Mboka Mwilambwe, Mayor

ATTEST

_____
Leslie Smith-Yocum, City Clerk

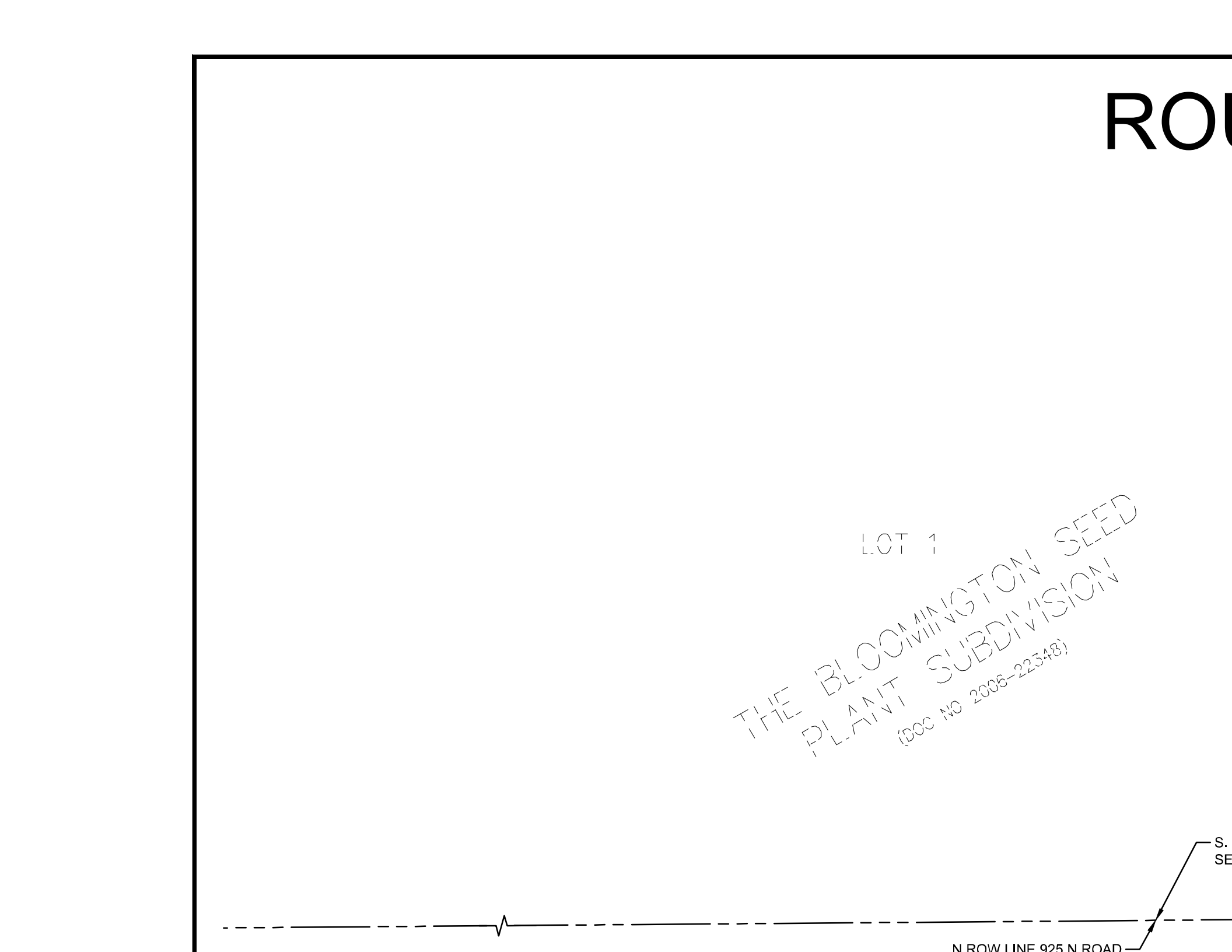
Exhibit A

Route 51 Subdivision Second Addition Description

A PART OF THE SOUTHEAST QUARTER OF SECTION 28, TOWNSHIP 23 NORTH, RANGE 2 EAST OF THE THIRD PRINCIPAL MERIDIAN, MCLEAN COUNTY, ILLINOIS, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF BLOOMINGTON SEED PLANT SUBDIVISION RECORDED AUGUST 15, 2006 AS DOCUMENT NO. 2006-22348. FROM SAID POINT OF BEGINNING, THENCE SOUTH 01°35'30" EAST, 299.00 FEET; THENCE SOUTH 89°31'45" WEST, 314.00 FEET; THENCE NORTH 01°35'30" WEST, 299.00 FEET TO THE SOUTH LINE OF SAID BLOOMINGTON SEED PLANT SUBDIVISION; THENCE NORTH 89°31'45" EAST, 314.00 FEET ALONG SAID SOUTH LINE TO THE POINT OF BEGINNING, CONTAINING 2.155 ACRES, MORE OR LESS.

ROU


LOT 1
THE BLOOMINGTON SEED
TITLE BLOOMINGTON
PLANT SUBDIVISION
PLANT SUBDIVISION
(DOC NO 2006-22348)
S.
SE
N ROW LINE 925 N ROAD

DocuSign Envelope ID: 11773190-04CA-4BE9-AC29-75D66D454EB0

PETITION FOR APPROVAL OF FINAL PLAT

State of Illinois)
)ss.
County of McLean)

TO: THE HONORABLE MAYOR AND CITY COUNCIL OF THE CITY OF BLOOMINGTON, MCLEAN COUNTY, ILLINOIS

Now come(s) *GROWMARK, Inc.* hereinafter referred to as "Petitioner(s)", respectfully representing and requesting as follows:

1. That your Petitioner(s) is(are) the owner(s) of the freehold or lesser estate thereinof the Property hereinafter legally described in Exhibit "A" and hereinafter referred to as "Property", which is attached hereto and made a part hereof by this reference, or is (are) a mortgagee or vendee in possession, assignee of rents, receiver, executor (executrix), trustee, lessee or other person, firm or corporation or the duly authorized agents of any of the above persons having proprietary interest in said property;

2. That your Petitioner(s) seek(s) approval of the Final Plat for the subdivision of said property to be known and described as *Route 51 Subdivision Second Addition*;

3. That your Petitioner(s) also seek(s) approval of the following exemptions or variations from the provisions of Chapter 24 of the Bloomington City Code, 1960: *none*;

WHEREFORE, your Petitioner(s) respectfully pray(s) that said Final Plat for the *Route 51 Subdivision Second Addition*, submitted herewith, be approved with the exemptions and/or variations as requested herein.

RESPECTFULLY SUBMITTED BY:

Shelly Kruse

Name: Shelly Kruse of GROWMARK, Inc.
Title: Executive Direct, Strategic Partnerships

9/26/2022 | 9:20 AM CDT

DocuSign Envelope ID: 11773190-04CA-4BE9-AC29-75D66D454EB0

EXHIBIT A

LEGAL DESCRIPTION
ROUTE 51 SUBDIVISION SECOND ADDITION

A PART OF THE SOUTHEAST QUARTER OF SECTION 28, TOWNSHIP 23 NORTH, RANGE 2 EAST OF THE THIRD PRINCIPAL MERIDIAN, MCLEAN COUNTY, ILLINOIS, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF BLOOMINGTON SEED PLANT SUBDIVISION RECORDED AUGUST 15, 2006 AS DOCUMENT NO. 2006-22348. FROM SAID POINT OF BEGINNING, THENCE SOUTH 01°35'30" EAST, 299.00 FEET; THENCE SOUTH 89°31'45" WEST, 314.00 FEET; THENCE NORTH 01°35'30" WEST, 299.00 FEET TO THE SOUTH LINE OF SAID BLOOMINGTON SEED PLANT SUBDIVISION; THENCE NORTH 89°31'45" EAST, 314.00 FEET ALONG SAID SOUTH LINE TO THE POINT OF BEGINNING, CONTAINING 2.155 ACRES, MORE OR LESS.

I HAVE SUBDIVIDED THIS PROPERTY INTO ONE LOT, NUMBERED 1, AND THE STREET AS SHOWN HEREON. SAID SUBDIVISION IS TO BE KNOWN AS "ROUTE 51 SUBDIVISION SECOND ADDITION" IN THE SOUTHEAST QUARTER OF SECTION 28, TOWNSHIP 23 NORTH, RANGE 2 EAST OF THE THIRD PRINCIPAL MERIDIAN, MCLEAN COUNTY, ILLINOIS.

THIS PROPERTY LIES WITHIN ZONE X (AREAS DETERMINED TO BE OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOOD PLAIN) ACCORDING TO THE FEDERAL EMERGENCY MANAGEMENT AGENCY'S NATIONAL FLOOD INSURANCE RATE MAP NO. 17113C0515E, WITH A REVISION DATE OF JULY 16, 2008, FOR MCLEAN COUNTY (COMMUNITY NO. 170931), ILLINOIS.

THIS PROPERTY LIES WITHIN 1 AND 1/2 MILES OF THE CORPORATE LIMITS OF THE CITY OF BLOOMINGTON, ILLINOIS.

PART OF PIN: 21-28-400-002

COUNTY CLERK'S CERTIFICATE

STATE OF ILLINOIS)
) SS.
COUNTY OF McLEAN)

I, Kathy Michael, County Clerk of McLean County, State of Illinois, do hereby certify that I have this day examined the tax records of the property shown on the attached plat and find no delinquent general taxes, unpaid current general taxes, delinquent special assessments, or unpaid current special assessments against the tract of land described in said plat, given under my hand and seal of this County on the 27th day of September 2022.

21-28-400-002

Kathy Michael

Kathy Michael, County Clerk
McLean County, Illinois

OWNER'S CERTIFICATE

STATE OF ILLINOIS)
SS
COUNTY OF McLEAN)

KNOW ALL MEN BY THESE PRESENTS: That I, the undersigned, hereby certify that I am authorized by the owner, Growmark, Inc., to sign ownership documents and that Growmark, Inc., is the owner of all the premises embodied in the attached Plat of Route 51 Subdivision Second Addition to McLean County, Illinois, and that I have caused said plat to be made and that it is a true and correct plat of the Route 51 Subdivision Second Addition as laid off into one lot and street by Joseph D. Adams, Registered Illinois Land Surveyor Number 3704. The undersigned, hereby dedicates to Bloomington Township in McLean County in the State of Illinois, and sets apart for the use of the general public forever the street and thoroughfare as indicated and shown on said Plat; and I further dedicate easements within the right-of-way of such street and thoroughfare to the applicable public utility companies for those utility installations that are permitted by this and other resolutions and codes of the County to be installed in street or thoroughfare right-of-way.

IN WITNESS WHEREOF I have hereunto set my hand and affixed my seal this 3rd day of August, 2022.

[redacted] (SEAL)
(Owner)

NOTARY CERTIFICATE

OFFICIAL SEAL
SANDRA L HEISSLER
NOTARY PUBLIC - STATE OF ILLINOIS
MY COMMISSION EXPIRES 02/09/23

STATE OF ILLINOIS)
SS
COUNTY OF McLEAN)

I, the undersigned, a Notary Public in and for said County and State aforesaid, do hereby certify that Shelly Kruse is personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that he signed, sealed, and delivered the said instrument as his free and voluntary act for the uses and purposes therein set forth, including the release and waiver of Homestead, and also including the dedication of all streets and highways to the use of the general public forever, and including the grant to certain general utility easements to the applicable public utility companies.

Given under my hand and notary seal this 3rd day of August, 2022.

[redacted] Notary Public

Prepared by and return to Shelly Kruse, Growmark, Inc., 1701 Towanda Ave., Bloomington, IL 61701 - phone 319-559-1553

McLean County

School District Certificate

This is to certify that I Shelly Kruse am authorized by the owner, Growmark, Inc., to sign ownership documents and that Growmark, Inc., is the owner of the property herein described in the Surveyor's Certificate, which will be known as Route 51 Subdivision Second Addition, to the best of my knowledge, is located within the boundaries of Community Unit School District # 5 and/or High School District #5 in McLean County, Illinois.

Dated this 3rd day of August, 2022

Shelly Kruse
Owner's Name

State of Illinois }
County of McLean

I, Sandra L. Heissler, a Notary Public in and for the County and State aforesaid, do hereby certify that Shelly Kruse is personally known to be the same person whose name is subscribed to the foregoing owner's statement, appeared before me, this day, in person and acknowledged the execution of this statement as his free and voluntary act.

Given under my hand and notarial seal this 3rd day of August, 2022.

[redacted]
Notary Public

OFFICIAL SEAL
SANDRA L HEISSLER
NOTARY PUBLIC - STATE OF ILLINOIS
MY COMMISSION EXPIRES:02/09/23

X:\BuildingZoningOffice\Forms\Recording Documents

Growmark, Inc. (Route 51 Subdivision Second Addition)

Date Prepared: 09/23/2022

Shown on Final Plat:		Initial
	Easements shown for all public improvements	N/A
	City Engineer's Signature Block	SJL
	Clerk's Signature Block	SJL
	Areas or facilities to be dedicated to the public	SJL
	Railroad Right of Ways	N/A
	Subdivision Boundaries	SJL
	References to nearest street lines, Township, Sections lines, or monuments.	SJL
	Name of Subdivision	SJL
	Legal Description	SJL
	Existing Parcel Id Number (PIN)	SJL
	Surveyor's statement regarding any Special Flood Hazard Areas.	SJL
	Total Acreage	SJL
	Street Names	SJL
	Proposed Lot numbers (consecutively numbered)	SJL
	Front Yard Setbacks	SJL
The following shall be provided:		
	School District Certificate	SJL
	County Clerk's Certificate	SJL
	Owner's Certificate	SJL
	Drainage Statement	SJL
	Owner's Petition	SJL
	Ordinance	SJL
	Utility Company Signoffs	N/A
	Digital PDF Submittal provided to Public Works	SJL
	Digital CAD format submittal provided to Public Works	Not yet
	2 Mylar Copies	
	12 Paper Copies	
The following requirements shall be met:		
	Final plat retains the design characteristics of a valid Preliminary Plan that has not expired	N/A
	Retains the design characteristics of approved public improvement engineering plans and specifications.	N/A
	Final Plat is signed by IL licensed surveyor	SJL
	Plans for all public improvements approved by Public Works	N/A

City of Bloomington Illinois
Public Works Department

Route 51 Subdivision Second Addition

0 150 300
Feet

Date: 9/21/2022

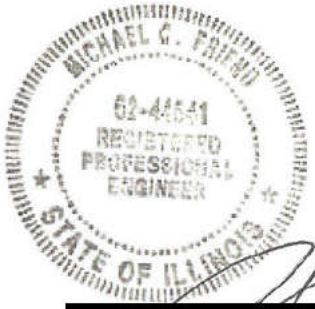


DRAINAGE STATEMENT

I, Michael C. Friend, Registered Professional Engineer, and Growmark, Inc., being the owners of the premises heretofore platted by Joseph D. Adams, Illinois Professional Land Surveyor No. 3704, to be and become the "Route 51 Subdivision Second Addition" in McLean County, Illinois, do hereby state that to the best of their knowledge and belief, the drainage of surface waters will not be changed by the construction of said Subdivision or any part thereof; or that if such surface waters drainage will be changed, reasonable provision has been made for collection and diversion of such surface waters into public areas or drains which the Subdivider has a right to use and that such waters will be planned for in accordance with generally accepted engineering practices so as to reduce the likelihood of damage to the adjoining property because of the construction of the Subdivision.

I further state that no lots are within the Special Flood Hazard Area, as identified by the Federal Emergency Management Agency.

Registered Professional Engineer No. 062-044541



ENGINEER: [redacted] 8/1/2022

BY: MICHAEL C. FRIEND P.E.

TOWNSHIP HIGHWAY COMMISSIONER PLAT ACCESS CERTIFICATE

STATE OF ILLINOIS
SS
COUNTY OF McLEAN)

I, Rodney Boester, Highway Commissioner of Bloomington Township of McLean County, Illinois, hereby certify that the Road Access is approved as shown on the final plat of the Route 51 Subdivision Second Addition.

Dated this 23rd day of August 2022

[redacted]
Signature of Highway Commissioner

X:\Notice\PlatAccessForm

CONSENT AGENDA ITEM NO. 7.H

FOR COUNCIL: October 10, 2022

WARD IMPACTED: City-Wide Impact

SUBJECT: Consideration and action on an Ordinance Authorizing a Construction Agreement between the City of Bloomington and G. A. Rich & Sons, Inc., for Water Treatment Plant Chemical Systems Improvements (Bid #2023-06), in the amount of $1,510,850, as requested by the Public Works Department.

RECOMMENDED MOTION: The proposed Ordinance be approved.

STRATEGIC PLAN LINK:
Goal 2. Upgrade City Infrastructure and Facilities

STRATEGIC PLAN SIGNIFICANCE:
Objective 2d. Well-designed, well maintained City facilities emphasizing productivity and customer service

BACKGROUND: On March 23, 2020, City Council approved a Design Contract with CDM Smith, Inc., for Water Treatment Plant Chemical Systems Improvements Design. The proposed project will provide an upgrade to the ammonia storage and feed system and a chlorine gas scrubber at the Water Treatment Plant to address the deficiencies in life safety, water quality integrity, and reliability.

The current ammonia system requires frequent manual adjustment of the feed rate throughout the day and includes no emergency ventilation system in the event of a leak of the anhydrous ammonia gas. In addition, the current chlorine system does not include a gas scrubber. The proposed chlorine gas scrubber will provide for emergency neutralization of chlorine gas in the event of a leak and provide protection to plant staff and the public. These deficiencies were determined during the condition assessment phase of the Water Infrastructure Master Plan. Addressing these issues that stem from the age, outdated design, and deferred maintenance will allow the plant operators to better supervise and control the chemical inventories and feed rates and bring the facilities into compliance with current regulations.

The Public Works Department prepared the Water Treatment Plant Chemical Systems Improvements proposal package and advertised the project for competitive bids. Bids for this contract were received until 10:00 AM on Thursday, September 1, 2022, electronically via the City's e-Procurement Portal, OPENGOV. Staff received one (1) bid and opened it at 10:01 AM Thursday, September 1, 2022, via a Virtual Bid Opening.

Public Works did not receive any other complete bids. Contingency is included in the bid and shall be used for unforeseen issues which may arise during the project. This contingency shall be at the City's sole discretion and any amount not used during the project shall revert to the City and not be paid to the contractor.

Due to the complex nature of this project, staff will be recommending that an outside consultant perform construction observation services. Public Works will be presenting an agreement for these services to Council for consideration at a future City Council Meeting.

COMMUNITY GROUPS/INTERESTED PERSONS CONTACTED: The Request for Bids was released through the City's OpenGov portal and advertised in *The Pantagraph* on August 4, 2022. A pre-bid meeting was held at 11:00 AM on August 17, 2022.

FINANCIAL IMPACT: If approved, the $1,510,850 for the Construction Agreement with GA Rich and Sons Inc., will be paid out of Water Purification - Water Plant Construction and Improvements account (50100130-72590). If approved, a budget transfer to move $210,850 from the Water Purification - Architectural & Engineering Services for Construction account (50100130-70051) to the Water Purification - Water Plant Construction and Improvements account (50100130-72590) to pay for the full construction portion of the project. Stakeholders can locate the items that were budgeted as two projects: Chlorine Gas Scrubber and Ammonia System Upgrade, combined to be awarded into one project: Water Treatment Plant Chemical Systems Improvements, in the FY 2023 Budget Book titled "Other Funds & Capital Improvement" on pages 129, 130, 225, 283, and 301-304.

AMERICAN RESCUE PLAN FUNDING IMPACT: N/A

COMMUNITY DEVELOPMENT IMPACT: **This request meets the following goals and objectives of the Bloomington Comprehensive Plan 2035**: Goal UEW-1. Provide quality public infrastructure within the City to protect public health, safety, and the environment. Objective UEW-1.5. Reliable water supply and distribution system that meets the needs of the current and future residents.

Respectfully submitted for consideration.

Prepared by: Brett Lueschen, Operations Manager

ATTACHMENTS:
PW 3B ORDINANCE WTP Chemical Systems Improvements 10102022
PW 3C COB Agreement WTP Chemical Systems Improvements
PW 3D EVALUATION TABULATION WTP Chemical Systems Improvements 10102022
PW 3E Procurement Documents Bid #2023-06 WTP Chemical Systems Improvements

ORDINANCE NO. 2022 - ___

AN ORDINANCE AUTHORIZING A CONSTRUCTION AGREEMENT BETWEEN THE CITY OF BLOOMINGTON AND G.A. Rich & Sons, Inc., FOR THE WATER TREATMENT PLANT Chemical Systems Improvements (BID #2023-06), IN THE AMOUNT OF $1,510,850

WHEREAS, the City of Bloomington ("City") is a home rule unit of local government with authority to legislate in matters concerning its local government and affairs; and

WHEREAS, subject to the provisions of the City Code, City staff is recommending an Agreement with G.A Rich and Sons, Inc. (CONTRACTOR) be approved for the WTP Chemical Systems Improvements (PROJECT) in the amount of $1,510,850; and

WHEREAS, PROJECT consists of work necessary to install a fully functional chlorine scrubber system, a fully functional Anhydrous Ammonia feed system, and contingency line items; and

WHEREAS, the City Council finds it in the best interest of the City to approve the contract.

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF BLOOMINGTON, ILLINOIS:

SECTION 1. The above recitals are incorporated herein by this reference as if specifically stated in full.

SECTION 2. The contract is approved and the City Manager, or designated representatives, are authorized to execute the Contract, and any other necessary documents to effectuate the purchase. The City Manager, or designee, is further authorized to approve any changes to the work utilizing the contingency amount set forth in the contract and within the contract amount, to the extent the City Manager finds such to be in the best interests of the City.

SECTION 3. In the event that any section, clause, provision, or part of this Ordinance shall be found and determined to be invalid by a court of competent jurisdiction, all valid parts that are severable from the invalid parts shall remain in full force and effect.

SECTION 4. The City Clerk is hereby authorized to publish this ordinance in pamphlet form as provided by law.

SECTION 5. This Ordinance is enacted pursuant to the authority granted to the City as a home rule unit by Article VII, Section 6 of the 1970 Illinois Constitution.

SECTION 6. This ordinance shall be effective immediately after its approval and publication as required by law.

PASSED this _10___ day of __October____ 2022.

APPROVED this ____ day of _October____ 2022.

CITY OF BLOOMINGTON

Mboka Mwilambwe, Mayor

ATTEST

Leslie Smith-Yocum, City Clerk

CITY OF BLOOMINGTON AGREEMENT WITH

G.A. Rich & Sons, Inc.

FOR

Chemical Systems Improvments

THIS AGREEMENT, dated this 10 day of October, 2022, is between the City of Bloomington, IL (hereinafter "CITY") and G.A. Rich & Sons, Inc. (hereinafter "VENDOR"). CITY and VENDOR may hereinafter collectively be referred to as the "PARTIES" and individually as the "PARTY".

NOW THEREFORE, the PARTIES agree as follows:

Section 1. **Recitals.** The recitals set forth above are incorporated into this Section 1 as if specifically stated herein.

Section 2. **Description of Services.** VENDOR shall provide the services/work identified on Exhibit A, attached hereto and incorporated herein.

Section 3. **Incorporation of Bid/RFP/RFQ & Proposal Terms.** The following shall apply to this Agreement:

☐ This Agreement was not subject to a formal solicitation process by the CITY.

☑ This Agreement was subject to the following procurement initiative by the CITY: Bid process Bid# 2023-06 (hereinafter "REQUEST"). Accordingly, the provisions of the REQUEST and the proposal submitted by VENDOR (hereinafter collectively referred to as "PROCUREMENT DOCUMENTS" and attached hereto), shall be incorporated into this Agreement and made a part thereof and shall be considered additional contractual requirements that must be met by VENDOR. In the event of a direct conflict between the provisions of this Agreement and the incorporated PROCUREMENT DOCUMENTS, the provisions of this Agreement shall prevail.

☐ This Agreement was not subject to a formal solicitation process by the CITY, but includes the other required proposal/documents attached hereto in Exhibit C.

Section 4. **Payment.** For the work performed by VENDOR under this Agreement, the City shall pay VENDOR one of the following:

☐ A flat fee of $_____ as set forth in the Payment Terms attached as Exhibit B, attached hereto and incorporated herein.

☑ Fees as set forth in the Payment Terms attached as Exhibit B, attached hereto and incorporated herein not to exceed $ 1,510,850.00 .

Section 5. **Requirement for Payment & Performance Bond.** The following shall further apply to this Agreement:

☐ This Agreement does not require the furnishment of any bonds by the VENDOR.

☑ This Agreement is subject to bonding requirements.

i. It is therefore understood that the VENDOR will furnish, at no expense to the CITY, Payment and Performance Bonds to the CITY in the amount of the contract as stated in Section 4 executed by the VENDOR and at least two sureties as set forth under the Laws of the State of Illinois, as a guarantee that the VENDOR will timely and faithfully perform the work outlined herein.

ii. Said bond shall be conditioned to save and keep harmless said CITY from any and all claims, demands, losses, suits, costs, expenses, and damages which may be brought, sustained, or recovered against said CITY by reason of any negligence, default, or failure of the said VENDOR in designing, building, constructing, or completing said improvement and its appurtenances, or any part thereof, and that said improvement when constructed shall be free from all defects and remain in good order and condition for one year from its completion and acceptance by the CITY, ordinary wear and tear, and damage resulting from accident or willful destruction excepted; which bond is attached hereto and made a part hereof.

Section 6. **Default.** Either PARTY shall be in default if it fails to perform all or any part of this Agreement. If either PARTY is in default, the other PARTY may terminate this contract upon giving written notice of such termination to the PARTY in default. Such notice shall be in writing and provided thirty (30) days prior to termination. The non-defaulting PARTY shall be entitled to all remedies as set forth in Section 9 herein, upon the default or violation of this Agreement.

Section 7. **Termination for Cause.** The CITY may, at any time, terminate this Agreement, in whole or in part, for any of the following reasons effective immediately:

i. VENDOR is found to be in violation of any term or condition of this Agreement.
ii. VENDOR engages in any fraudulent, felonious, grossly negligent, or other illegal acts or behavior.
iii. VENDOR declares bankruptcy or becomes insolvent.
iv. CITY determines, in its sole discretion, that VENDOR is no longer able to fulfill VENDOR's obligations under this Agreement or PROCUREMENT DOCUMENTS.

Upon such termination, CITY shall be entitled to all remedies laid out in Section 9, as well as reimbursement of reasonable attorney's fees and court costs.

Section 8. **Force Majeure.** The CITY shall not be in default of this Agreement and shall not be held liable for any losses, failure, or delay in performance of its obligations under this Agreement or any Agreement, Amendment, Exhibit, or Attachment hereto arising out of or caused, directly or indirectly, by an event of Force Majeure. Force Majeure is defined as circumstances beyond the CITY's reasonable control, including, without limitation, acts of God; earthquakes; fires; floods; wars; civil or military disturbances; acts of terrorism; sabotage; strikes; epidemics; pandemics; riots; power failures; computer failure and any such circumstances beyond its reasonable control as may cause interruption, loss or malfunction of utility, transportation, computer (hardware or software) or telephone communication service; accidents; labor disputes; acts of civil or military authority; governmental actions; or inability to obtain labor, material, equipment or transportation.

Section 9. **Remedies.** In the event of a default or a violation of this Agreement, the non-defaulting PARTY shall be entitled to all remedies, whether in law or equity.

Section 10. **Indemnification.** To the fullest extent permitted by law, VENDOR shall indemnify and hold harmless CITY, its officers, officials, agents, and employees from claims, demands, causes of action, and liabilities of every kind and nature whatsoever arising out of or in connection with VENDOR's operations performed under this Agreement, except for loss, damage, or expense arising from the sole gross negligence or willful misconduct of the CITY or the CITY's agents, servants, or independent VENDORs who are directly responsible to CITY. This indemnification shall extend to all claims occurring after this Agreement is terminated as well as while it is in force. The indemnity shall apply regardless of any concurrent negligence, whether active or passive, of the CITY or CITY's officers, officials, agents, employees, or any other persons or entities. The indemnity set forth in this section shall not be limited by insurance requirements or by any other provision of this Agreement.

Section 11. **Reuse of Documents.** All documents, including but not limited to, reports, drawings, specifications, and electronic media furnished by VENDOR pursuant to this Agreement are instruments of the VENDOR's services. Nothing herein, however, shall limit the CITY's right to use the documents for municipal purposes, including but not limited to the CITY's right to use documents in an unencumbered manner for purposes of remediation, remodeling, and/or construction. VENDOR further acknowledges any such documents may be subject to release under the Illinois Freedom of Information Act.

Section 12. **Standard of Care.** Services performed by VENDOR under this Agreement will be conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the same or similar profession currently practicing under the same or similar conditions.

Section 13. **Representations of VENDOR.** VENDOR hereby represents it is legally able to perform the work that is subject to the Agreement.

Section 14. **Compliance with Local, State, and Federal Laws.** VENDOR agrees that any and all work by VENDOR shall at all times comply with all laws, ordinances, statutes, and governmental rules, regulations and codes.

Section 15. **Compliance with Prevailing Wage.** The following shall apply to this Agreement:

☐ This Agreement is not for "public works" and therefore Prevailing Wage does not apply.

☑ This Agreement calls for the construction of "public works," within the meaning of the Illinois Prevailing Wage Act, 820 ILCS 130.01 et seq. (hereinafter "ACT"). The ACT requires contractors and subcontractors to pay laborers, workers, and mechanics performing services on public works projects no less than the current "prevailing rate of wages" (hourly cash wages plus an amount for fringe benefits) in the county where the work is performed. The Illinois Department of Labor (hereinafter "DEPARTMENT") publishes the prevailing wage rates on its website at http://labor.illinois.gov/. The DEPARTMENT revises the prevailing wage rates and the contractor/subcontractor has an obligation to check the DEPARTMENT's website for revisions to prevailing wage rates. For information regarding current prevailing wage rates, please refer to thee DEPARTMENT's website. All contractors and subcontractor rendering services under this Agreement much comply with all requirements of the ACT, including but not limited to all wage requirements and notice and record keeping duties.

Section 16. **Equal Opportunity Employment.** During the performance of this Agreement, the VENDOR agrees as follows:

i. The VENDOR will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The VENDOR will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The VENDOR agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

ii. The VENDOR will, in all solicitations or advertisements for employees placed by or on behalf of the VENDOR, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

iii. The VENDOR will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the VENDOR's legal duty to furnish information.

iv. The VENDOR will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the VENDOR's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

Section 17. **Access to Records.** The following access to records requirements apply to this Agreement:

i. The VENDOR agrees to provide CITY, or any of their authorized representatives access to any books, documents, papers, and records of the VENDOR which are directly pertinent to this Agreement for the purposes of making audits, examinations, excerpts, and transcriptions.

ii. The VENDOR agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

Section 18. **Compliance with FOIA Requirements.** VENDOR further explicitly agrees to furnish all records related to this Agreement and any documentation related to CITY required under the Illinois Freedom of Information Act (ILCS 140/1 et seq.) (hereinafter "FOIA") request within five (5) business days after CITY issues notice of such request to VENDOR. VENDOR agrees to not apply any costs or charge any fees to the CITY regarding the procurement of records required pursuant to a FOIA request. VENDOR agrees to defend, indemnify, and hold harmless CITY, and agrees to pay all reasonable costs connected therewith (including, but not limited to, reasonable attorney's and witness fees, filing fees, and any other expenses) for CITY to defend any and all causes, actions, causes of action, disputes, prosecutions, of conflicts arising from VENDOR actual or alleged violation of FOIA, or VENDOR failure to furnish all documentation related to a request within five (5) business days after CITY

issues notice of request. Furthermore, should VENDOR request that CITY utilize a lawful exemption under FOIA in relation to any FOIA request, thereby denying that request, VENDOR agrees to pay all costs connected therewith (such as reasonable attorney's and witness fees, filing fees, and any other expenses) to defend the denial of the request. The defense shall include, but not be limited to, challenged or appealed denials of FOIA requests to either the Illinois Attorney General or a court of competent jurisdiction. VENDOR agrees to defend, indemnify, and hold harmless CITY, and agrees to pay all costs connected therewith (such as reasonable attorney's and witness fees, filing fees, and any other expenses) to defend any denial of a FOIA request by VENDOR request to utilize a lawful exemption to CITY.

Section 19. **Notices.** All legal notices given in connection with this Agreement shall be made in writing and deemed complete by way of (a) hand delivery; (b) registered mail, postage prepaid; or (c) electronic mail with notice of receipt by the other PARTY at the following addresses or at such other address for a PARTY as shall be specified by like notice:

If to VENDOR:

G.A. Rich & Sons, Inc.
Attn: Tammy Stimson
204 S. Perry, PO Box 50
Deer Creek, IL. 61733
tammy@garich.com

Copy to:
G.A. Rich & Sons, Inc.
Attn: Brian Rich
204 S. Perry, PO Box 50
Deer Creek, IL. 61733
Brian@garich.com

If to CITY:

City of Bloomington
Attn: City Manager
115 E. Washington St., Suite 103
Bloomington, IL 61701
admin@cityblm.org

Copy to:
City of Bloomington
Attn: Legal Department
115 E. Washington St., Suite 103
Bloomington, IL 61701
legal@cityblm.org

Section 20. **Insurance.** VENDOR shall, at a minimum, maintain insurance as required in the PROCUREMENT DOCUMENTS or as agreed upon with the City Procurement Manager. Certificates of insurance shall be provided to the CITY and CITY shall be named as additional insured under the policy(ies).

Section 21. **Assignment.** No PARTY may assign this Agreement, of the proceeds thereof, without prior written consent of the other PARTY.

Section 22. **Changes or Modifications.** This Agreement, its method of completion, its scope of work, nor its pricing may be modified or changed in any manner without the express written consent of both PARTIES via an Amendment fully executed by both PARTIES.

Section 23. **Governing Law.** This Agreement shall be governed by and interpreted pursuant to the laws of the State of Illinois, County of McLean.

Section 24. **Joint Drafting.** The PARTIES expressly agree that this Agreement was jointly drafted, and that both had the opportunity to negotiate its terms and to obtain the assistance of counsel in reviewing its terms prior to execution. Therefore, this Agreement shall be construed neither against nor in favor of either PARTY but shall be construed in a neutral manner.

Section 25. **Attorney's Fees.** In the event that any action is filed in relation to this Agreement, the unsuccessful PARTY in the action shall pay to the successful PARTY, in addition to all the sums that either PARTY may be called on to pay, a reasonable sum for the successful PARTY's attorney's fees (including expert witness fees).

Section 26. **Paragraph Headings.** The titles to the paragraphs of this agreement are solely for the convenience of the PARTIES and shall not be used to explain, modify, simplify, or aid in the interpretation of the provisions of this Agreement.

Section 27. **Term.** The term of this Agreement shall be:

☑ Until all of the services and/or deliverables required to be provided within this Agreement are completed and accepted by CITY.

☐ From _____ year(s) from the date of this Agreement listed above.

☐ By the date state in the PROCUREMENT DOCUMENTS or no later than _____.

☐ This Agreement shall also be subject to the following renewal terms, if any:

_____.

Notwithstanding anything herein, the provisions in Sections 10 and 18 shall survive termination.

Section 28. **Counterparts.** This Agreement may be executed in any number of counterparts, including electronically, each of which shall be deemed to be an original, but all of which together shall constitute the same instrument.

IN WITNESS WHEREOF, the PARTIES hereto have executed this Space Sharing Agreement as of the date first above written.

CITY OF BLOOMINGTON

By: _____
Its City Manager

ATTEST:

By: _____
Its City Clerk

VENDOR C. A. Rich & Sons Inc

By: [redacted]
Its President

By: [redacted]
Its Notary

OFFICIAL SEAL
JUDY C STECHMAN
NOTARY PUBLIC, STATE OF ILLINOIS
TAZEWELL COUNTY
MY COMMISSION EXPIRES 02/04/2023

EXHIBIT A
DESCRIPTION OF SERVICES/WORK PROVIDED

All work shown in the Chemical System Improvements procurement documents for installation of a fully functional chlorine scrubber system. Including structural, HVAC, electrical, installation, labor, materials, equipment, and all other work necessary to complete the installation.

All work shown in the Chemical System Improvements procurement documents for installation of a fully functional Anhydrous Ammonia feed system. Including structural, HVAC, electrical, installation, labor, materials, equipment, and all other work necessary to complete the installation.

EXHIBIT B
PAYMENT TERMS

Payments will be made per application and recommendation by the site engineer.

The bid amounts are as follows:

1a	Chlorine Scrubber System	$875,000.00
1b	Scrubber Contingency 10%	$87,500.00
2a	Ammonia Feed System	$498,500.00
2b	Ammonia Contingency 10%	$49,850.00
Total		$1,510,850.00

City of Bloomington
Public Works
Kevin Kothe, Director
115 East Washington Street, Suite 403, Bloomington, IL 61701

EVALUATION TABULATION

ITB No. Bid 2023-06

WTP Chemical Systems Improvements

RESPONSE DEADLINE: September 1, 2022 at 10:00 am

SELECTED VENDOR TOTALS

Vendor	Total
G. A. Rich & Sons, Inc.	$1,510,850.00

INVITATION TO BID

Bid 2023-06

WTP CHEMICAL SYSTEMS IMPROVEMENTS

City of Bloomington

115 East Washington Street, Suite 403

Bloomington, IL 61701

RELEASE DATE: August 4, 2022

DEADLINE FOR QUESTIONS: August 19, 2022

RESPONSE DEADLINE: September 1, 2022, 10:00 am

RESPONSES MUST BE SUBMITTED ELECTRONICALLY TO:

https://secure.procurenow.com/portal/cityblm

City of Bloomington

INVITATION TO BID

WTP Chemical Systems Improvements

I. Legal Notice .....
II. Introduction .....
III. Instruction to Bidders/Consultants .....
IV. Scope of Work .....
V. Pricing Proposal .....
VI. Insurance Requirements .....
VII. Terms and Conditions .....
VIII. Vendor Questionnaire .....

Attachments:

A - Bid #2023-06 WTP Chemical Systems Improvements Specifications

B - Bid #2023-06 WTP Chemical Systems Improvements Sealed Drawings

1. LEGAL NOTICE

1.1. Invitation to Bid - City of Bloomington, Illinois

Sealed bids will be received via the City's e-Procurement Portal, Procurenow (https://secure.procurenow.com/portal/cityblm), until Thursday, September 1, 2022 at 10:00 am Central time, at which time they will be publicly opened and read for the following:

BID #Bid 2023-06

WTP Chemical Systems Improvements

A non-mandatory pre-bid meeting/site visit will be held on Wednesday, August 17, 2022 at 11:00 am central time, at:
City of Bloomington Water Treatment Plant at 25515 Waterside Way, Hudson, IL 61748.

It is highly suggested that interested parties attend. This is the only time scheduled for a site visit.

Bid documents are to be obtained from the City's e-Procurement Portal. Bidders/Consultants shall create a FREE account with ProcureNow by signing up at https://secure.procurenow.com/signup. Once account registration has been completed, browse back to https://secure.procurenow.com/portal/cityblm, click on "Submit Response", and follow the instructions to submit the electronic bid. Only Bidders/Consultants following the project, with an active account, are eligible for the contract award.

We encourage bidders and the public to participate remotely by watching/listening to the bid opening remotely via the City's livestream: www.cityblm.org/bidopening.

The City of Bloomington reserves the right to reject any and all bids and to waive technicalities.

Bid must be accompanied by a Bid guaranty which shall not be less than ten percent (10%) of the amount of the Bid. Bid guaranty may be a cashier's check, money order, certified bank check, or a surety bond. All guaranties, except surety bonds, will be deposited and reimbursement checks and surety bonds will be issued to unsuccessful bidders following the bid award. The successful bidder will be required to provide Performance and Payment Bonds in the amount equal to 100% of the contract price, within ten (10) business days after the bid award.

The City of Bloomington requires all Bidders/Consultants doing business with the City not to discriminate on the basis of race, age, color, religion, gender, ancestry, national origin, marital status, mental or physical disability unrelated to ability, familial status or sexual orientation.

Carla Murillo, Procurement Manager

Thursday, August 4, 2022, Bloomington, Illinois

2. INTRODUCTION

2.1. Summary

The City of Bloomington, Illinois ("City") is accepting sealed bids for Bid 2023-06, WTP Chemical Systems Improvements to be submitted via the City's e-Procurement Portal, ProcureNow until Thursday, September 1, 2022, 10:00 am CST.

2.2. Background

The City of Bloomington, incorporated in 1856, is a home rule unit of government under the 1970 Illinois Constitution. The City of Bloomington is located in the heart of Central Illinois, approximately 125 miles southwest of Chicago, 155 miles northeast of St. Louis and 64 miles northeast of Springfield, the State Capital. The City of Bloomington is the County Seat of McLean County, the largest county in Illinois (approximately 762,240 acres). The results of the 2010 Census shows the City now has a population of 76,610 citizens. The economic strength of the City of Bloomington metropolitan area is well diversified with no single dominating industry.

2.3. Contact Information

Carla Murillo
Procurement Manager
109 E Olive Street
Bloomington, IL 61701
Email: cmurillo@cityblm.org
Phone: (309) 434-2277

Department:
Public Works

2.4. Timeline

The following projected timetable should be used as a working guide for planning purposes. The City reserves the right to adjust this timetable as required during the course of this statement process.

Bid Released	August 4, 2022
Pre-Bid Meeting/Site Visit (Non-Mandatory)	August 17, 2022, 11:00am City of Bloomington Water Treatment Plant at 25515 Waterside Way, Hudson, IL 61748.
Questions Due to City	August 19, 2022, 4:00pm
Response from City	August 24, 2022, 4:00pm

Bids Due	September 1, 2022, 10:00am
Bid Opening	September 1, 2022, 10:00am We encourage bidders and the public to participate remotely by watching/listening to the bid opening remotely via the City's livestream: www.cityblm.org/bidopening.
Anticipated Award Date	September 26, 2022

3. INSTRUCTION TO BIDDERS/CONSULTANTS

3.1. Bid Submission

Bidders/Consultants are required to submit sealed bids via the City's e-Procurement Portal, until Thursday, September 1, 2022, 10:00 am CST.

3.2. Definition

"City" shall mean the City of Bloomington, Illinois.

3.3. Pre-Bid Meeting

A non-mandatory pre-bid meeting will be held on Wednesday, August 17, 2022, commencing promptly at 11:00 am, and will be held:

City of Bloomington Water Treatment Plant at 25515 Waterside Way, Hudson, IL 61748.

A site visit will be held immediately following the pre-bid meeting.

The purpose of the pre-bid meeting is to allow an open forum for discussion and questioning with City staff regarding the ITB with all prospective bidders/consultants having an equal opportunity to hear and participate. Oral questions will receive oral responses, neither of which will be official, nor become part of the ITB. Only written responses to written questions will be considered official, and will be included as part of the ITB.

All prospective bidders/consultants are strongly encouraged to attend.

3.4. Questions

All questions related to this Invitation to bid (ITB) shall be submitted in writing through the ProcureNow Question/Answer Tab via the City's e-Procurement portal, on or before, Friday, August 19, 2022 by 4:00 pm. Please include the section title for each question, if applicable, in order to ensure that questions asked are responded to correctly. All questions submitted and answers provided shall be electronically distributed to bidders/consultants following this solicitation on the City's e-Procurement Portal.

3.5. Addenda

Any addenda shall be posted on the City's e-Procurement Portal. Addenda notifications will be emailed to all persons on record as following this ITB. Failure of any bidder/consultant to receive any such addenda or interpretation shall not relieve such bidder/consultant from any obligation under their bid as submitted. All addenda so issued shall become part of the contract documents.

3.6. Withdrawal of Bid

Bids may be withdrawn through the City's e-Procurement Portal, the responding firm may “unsubmit” their bid in ProcureNow. After withdrawing a previously submitted bid, the responding firm may submit another bid at any time up to the deadline for submitting bids prior to the bid opening. Except as otherwise provided by regulation, all decisions to permit the correction or withdrawal of bids following the bid opening, or to cancel awards or contracts based on bid mistakes, will be submitted in writing and will be supported by a written determination made by the Procurement Manager.

3.7. Rejection of Bids

The City of Bloomington reserves the right to reject any and all bids and to waive technicalities and to accept that bid which is to be considered to be in the best interest of the City. Any such decision shall be considered final.

3.8. Bid Opening

Telephone/Fax/Verbal Offers Will Not Be Accepted.

Bids shall be publicly opened and read at the time and date set. It is the responsibility of the Bidders/Consultants/Contractors to see that the bid is submitted in the City's e-Procurement Portal, by the specified time and date. Bids received after the time and date will not be accepted.

4. SCOPE OF WORK

4.1. WTP Chemical System Improvements

Please see attached specifications and drawings for detailed requirements.

City of Bloomington, IL

Chemical Systems Improvements Project

BID DOCUMENTS

Bid #2023-06

December 2021

CDM Smith

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This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

EJCDC®
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Issued and Published Jointly by

ACEC
AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

National Society of Professional Engineers®

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To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

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10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .

15. *Contract Times*—The number of calendar days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work. Where the term "Working Days" is used that shall refer to those days inclusive of and between Monday to Friday.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

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19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Engineer*—The individual or entity named as such in the Agreement.

21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.

23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.

26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

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31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.

33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.

35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

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41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

46. *Unit Price Work*—Work to be paid for on the basis of unit prices.

47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

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B. *Intent of Certain Terms or Adjectives*:

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*:

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*:

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).

E. *Furnish, Install, Perform, Provide*:

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

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3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Contractor's Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

C. *Evidence of Owner's Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

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2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

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2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

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3.02 *Reference Standards*

A. *Standards Specifications, Codes, Laws and Regulations:*

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*:

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

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3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*:

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of

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Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

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1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. abnormal weather conditions;

3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and

4. acts of war or terrorism.

D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility

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that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.

E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*:

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas;

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provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and

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3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or

2. is of such a nature as to require a change in the Drawings or Specifications; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine

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the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

    b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

    c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

    a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or

    b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

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c. Contractor failed to give the written notice as required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;

c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

C. *Engineer's Review*: Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or

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schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;

    b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

    c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and

    d. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

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5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

2. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm

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such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.

H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or

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arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.

D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.

E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

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F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

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G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.

H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.

I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.

J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

A. *Workers' Compensation*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.

2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).

3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).

B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:

1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.

2. claims for damages insured by reasonably available personal injury liability coverage.

3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

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1. Products and completed operations coverage:

    a. Such insurance shall be maintained for three years after final payment.

    b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Broad form property damage coverage.

4. Severability of interest.

5. Underground, explosion, and collapse coverage.

6. Personal injury coverage.

7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.

E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the

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Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:

1. include at least the specific coverages provided in this Article.

2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.

3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.

4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.

5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.

J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

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6.04 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."

2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent

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constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

6. extend to cover damage or loss to insured property while in transit.

7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

8. allow for the waiver of the insurer's subrogation rights, as set forth below.

9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.

10. not include a co-insurance clause.

11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.

12. include performance/hot testing and start-up.

13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.

B. *Notice of Cancellation or Change*: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will

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provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.

F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property

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insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary

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to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 *"Or Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is

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followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

    a. in the exercise of reasonable judgment Engineer determines that:

        1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

        2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

        3) it has a proven record of performance and availability of responsive service; and

        4) it is not objectionable to Owner.

    b. Contractor certifies that, if approved and incorporated into the Work:

        1) there will be no increase in cost to the Owner or increase in Contract Times; and

        2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

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E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

a. shall certify that the proposed substitute item will:

1) perform adequately the functions and achieve the results called for by the general design,

2) be similar in substance to that specified, and

3) be suited to the same use as that specified.

b. will state:

1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,

2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

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3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:

1) all variations of the proposed substitute item from that specified, and

2) available engineering, sales, maintenance, repair, and replacement services.

d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

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7.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.

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J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising

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out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that

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the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them

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in the protection, removal, relocation, and replacement of their property or work in progress.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage,

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injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements*:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings*:

a. Contractor shall submit the number of copies required in the Specifications.

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b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples*:

a. Contractor shall submit the number of Samples required in the Specifications.

b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Other Submittals*: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. *Engineer's Review*:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

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5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures*:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

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2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal;

6. the issuance of a notice of acceptability by Engineer;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by Owner.

D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor,

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any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.

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E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

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1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. an itemization of the specific matters to be covered by such authority and responsibility; and

3. the extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.

C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

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D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

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C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

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ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

A. Engineer has the authority to reject Work in accordance with Article 14.

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10.05 *Shop Drawings, Change Orders and Payments*

A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.

B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.

C. Engineer's authority as to Change Orders is set forth in Article 11.

D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

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D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

1. *Change Orders*:

a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.

b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. *Work Change Directives*: A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must

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submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or

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2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

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11.05 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.

B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures*: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

2. *Engineer's Action*: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. *Binding Decision*: Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

B. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the

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Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and

4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

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2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*:

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A

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denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in

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connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

    f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the

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deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

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E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual

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conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.

E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and shall cooperate with inspection personnel to facilitate required inspections.

B. Contractor shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Contractor, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

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D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

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E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

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1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

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D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

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2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

    a. the Work has progressed to the point indicated;

    b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

    c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

    a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

    b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

    a. to supervise, direct, or control the Work, or

    b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

    c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

    d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or

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e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner:*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

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d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. the Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. the Contract Price has been reduced by Change Orders;

i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;

j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

l. there are other items entitling Owner to a set off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

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15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

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15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.

2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*:

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

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inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents;

   b. consent of the surety, if any, to final payment;

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects or will so pass upon final payment.

   d. a list of all disputes that Contractor believes are unsettled; and

   e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance*:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

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C. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such other adjacent areas;

2. correct such defective Work;

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and

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replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

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B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

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1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and

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2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents and arising after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this Article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

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18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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SECTION 007300.16 - SUPPLEMENTARY CONDITIONS

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PART II – FEDERAL, STATE, AND LOCAL GOVERNMENT PROVISIONS

1.0. FEDERAL GOVERNMENT PROVISIONS - NONE

2.0. STATE GOVERNMENT PROVISIONS
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3.0. CITY OF BLOOMINGTON PROVISIONS

4.0 ILLINOIS PREVAILING WAGE ACT AND DAIS-BACON ACT WAGE RATES FOR McLean COUNTY, ILLINOIS

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SECTION 007300.16 - SUPPLEMENTARY CONDITIONS

PART 1 - AMENDMENTS TO GENERAL CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC Document No. C-700, 2013 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

SC-1.01A.38.

Delete paragraph 1.01A.38. of the General Conditions in its entirety and replace with the following:

38. Specifications - Sections included under Division 01 through Division 46 of the Project Manual.

ARTICLE 2 - PRELIMINARY MATTERS

SC-2.01

Delete Paragraph 2.01 of the General Conditions in its entirety.

SC-2.02

Delete Paragraph 2.02 of the General Conditions in its entirety.

ARTICLE 4 - COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01A.

Delete Paragraph 4.01A of the General Conditions in its entirety.

ARTICLE 5 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03A.1.

Delete Paragraph 5.03 A.1 of the General Conditions in its entirety and replace it with the following:

1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents. Engineer has relied upon the data obtained from subsurface investigations made at the site in the form of test borings. Such data is in the form of boring logs and report which are included in the Appendix to the Project Manual. The locations of the test borings are indicated in the Appendix. Such logs and samples are part of the Contract Documents.

SC-5.06

Delete Paragraphs 5.06A and 5.06B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site, are known to Owner.

SC-5.07A

Insert Paragraphs 5.07 as follows:

A. Site Topographical and Utility Survey: In preparation of the Contract Documents the Engineer relied fully on existing record drawings. No topographical or utility survey was performed in the development of the Contract Documents.

ARTICLE 6 - BONDS AND INSURANCE

SC Article 6

Delete Article 6 of the General Conditions in its entirety.

ARTICLE 7 - CONTRACTOR'S RESPONSIBILITIES

SC-7.02

Add the following paragraphs immediately after Paragraph 7.02B. of the General Conditions which are to read as follows:

C. Regular working hours are defined as 8 hours per day, Monday through Friday, excluding holidays, between the hours of 7:00 AM and 7:00 PM. Requests to work other than regular working hours shall be submitted to Engineer not less than 48 hours prior to any proposed weekend work or scheduled extended work weeks. Occasional unscheduled overtime on weekdays may be permitted provided a minimum of 24 hours' notice is given to Engineer.

D. Contractor shall employ only competent persons to do the work and whenever Owner shall notify Contractor, in writing, that any person on the Work appears to be incompetent, disorderly, or otherwise unsatisfactory, such person shall be removed from the Project and shall not again be employed on it except with the consent of Owner.

E. Contractor is responsible for background checks for all employees and subcontractors. This is a secured site, and all entry to the site shall be through a secured perimeter. Unauthorized access will not be permitted at any time.

SC-7.04

Delete Paragraph 7.04 of the General Conditions in its entirety.

SC-7.05

Delete Paragraph 7.05 of the General Conditions in its entirety.

SC-7.07B

Delete Paragraph 7.07B of the General Conditions in its entirety.

SC-7.09A

Add the following new sentences at the end of Paragraph 7.09A of the General Conditions to read as follows:

The materials and supplies to be used in the Work of this Contract are exempt from the Sales and Use Tax of the State of Illinois. Contractor shall obtain the proper certificates, maintain the necessary records and otherwise comply with the requirements of existing regulations and any amendments thereto.

SC-7.15A.

Delete the last sentence in Paragraph 7.15A. of the General Conditions in its entirety and replace with the following:

If Engineer determines that the incident giving rise to the emergency action was not the responsibility of the Contractor and that a change in the Contract Document is required because of the action taken by the Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

SC-7.16D.1.

Add the following new sentence at the end of paragraph 7.16.D.1 of the General Conditions to read as follows:

Approval of Shop Drawings for equipment requiring Efficiency Guarantee Bonds will be withheld until the receipt of such Bonds.

SC-7.17A.

Add the following new paragraph immediately after Paragraph 7.17A. of the General Conditions which is to read as follow:

B. The Contractor guarantees that the Work and Services to be performed under the Contract, and all workmanship, materials and equipment performed, furnished, used or installed in the construction of the

same shall be free from defects and flaws, and shall be performed and furnished in strict accordance with the Drawings, Specifications, and other Contract Documents, that the strength of all parts of all manufactured equipment shall be adequate and as specified and that the performance test requirements of the Contract shall be fulfilled. This guarantee shall be for a period of one year from and after the date of substantial completion. If part of the Work is accepted in accordance with Paragraph 15.04 of the General Conditions, the guarantee for that part of the Work shall be for a period of one year from the date fixed for such acceptance.

1. If at any time within the said period of guarantee any part of the Work requires repairing, correction or replacement, the Owner may notify the Contractor in writing to make the required repairs, correction or replacements. If the Contractor neglects to commence making such repairs, corrections or replacements to the satisfaction of the Owner within seven (7) days from the date of receipt of such notice, or having commenced fails to prosecute such Work with diligence, the Owner may employ other persons to make said repairs, correction or replacements, and charge the costs, including compensation for additional professional services, to the Contractor.

2. The Contractor's guarantee under Paragraphs 7.17A and 7.17B, is in addition to the Contractor's express or implied warranties under this Contract and State law and in no way diminish any other rights that the Owner may have against the Contractor.

SC-7.17B., C. and D.

Renumber Paragraphs 7.17B., 7.17C and 7.17D. of the General Conditions to read 7.17C., 7.17D. and 7.17E.

SC-7.17E.

Add the following new paragraph immediately after Paragraph 7.17E. of the General Conditions which is to read as follows:

F. Manufacturer's Guaranty/Warranty

1. The Contractor shall obtain the following guaranty/warranty from the manufacturer of all major pieces of equipment furnished and installed on this Project. Such guaranty/warranty shall be for the benefit of Owner and be furnished in writing by the manufacturer. The Contractor's and manufacturer's obligations under this provision are in addition to other express or implied warranties under the Contract Documents and under the law and in no way diminish any other right that the Owner may have against the Contractor or manufacturer for faulty material, equipment or work. The warranty period shall not be interpreted as a limitation on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

2. The manufacturer warrants and guarantees for a period of one year from the date of Substantial Completion, or such longer period that may be specified in the Contract Documents, that all materials and equipment furnished and installed shall be free from flaws, defects in material and workmanship and shall be in conformance with the Contract Documents.

SC-7.18

Delete Paragraph 7.18 of the General Conditions in its entirety.

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ARTICLE 8. OTHER WORK AT THE SITE

SC-8.03 A

Delete paragraph 8.03 A of the General Conditions in its entirety and replace with the following.

A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall not institute any action, legal or equitable, against Owner, Engineer, Engineer's Consultants or the Construction Coordinator or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from Owner, Engineer, Engineer's Consultants or the Construction Coordinator on account of any such damage or claim. If Contractor is delayed at any time in performing or furnishing Work by any act or neglect of a separate contractor and Owner and Contractor are unable to agree as to the extent of any adjustment in Contract Times attributable thereto, Contractor may make a claim for an extension of times in accordance with Article 12. An extension of the Contract Times shall be Contractor's exclusive remedy with respect to Owner, Engineer, Engineer's Consultants and Construction Coordinator for any delay, disruption, interference or hindrance caused by any separate contractor. This paragraph does not prevent recovery from Owner, Engineer, Engineer's Consultant or Construction Coordinator for activities that are their respective responsibilities.

SC-8.03D.

Delete Paragraph 8.03 D of the General Conditions in its entirety and replace with the following.

D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, Engineer's Consultants, the Construction Coordinator or any person then Contractor shall promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, Contractor shall, to the fullest extent permitted by Laws and Regulations defend, indemnify and hold Owner, Engineer, Engineer's Consultants and the Construction Coordinator harmless from and against all claims, damages, losses and expenses (including, but not limited to, fees of engineers, architects, attorneys and other professionals, and court and arbitration or mediation costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any separate contractor against Owner, Engineer, Engineer's Consultants or the Construction Coordinator to the extent based on a claim arising out of Contractor's performance of the Work.

ARTICLE 9. OWNER'S RESPONSIBILITIES

SC-9.06

Delete Paragraph 9.06 of the General Conditions in its entirety.

SC-9.11A.

Add the following new paragraph immediately after Paragraph 9.11A of the General Conditions which is to read as follows:

B. Upon request of Contractor prior to the execution of any Change Order involving a significant percent increase in the Contract Price, Owner shall furnish to Contractor responsible evidence that adequate financial arrangements have been made by Owner to enable Owner to fulfill the increased financial obligations to be undertaken by Owner as a result of such Change Order.

SC-9.13

Add the following new paragraph immediately after Paragraph 9.12 of the General Conditions which is to read as follows:

SC-9.13 Owner's Site Representative

A. Owner will furnish an "Owner's Site Representative" to represent Owner at the Site and assist Owner in observing the progress and quality of the Work. The Owner's Site Representative is not Engineer's consultant, agent, or employee.

ARTICLE 10 - ENGINEER'S STATUS DURING CONSTRUCTION

SC-*10.03 Project Representative*

SC-10.03

Add the following new paragraphs immediately after paragraph 10.03A of the General Conditions which are to read as follows:

B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions. RPR will be directly employed by the Owner.

1. General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner only with the knowledge of and under the direction of Engineer.

2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
3. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.

4. Liaison:

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a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.

5. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.

6. Shop Drawings and Samples:

a. Record date of receipt of Samples and Contractor-approved Shop Drawings.

b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.

c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.

7. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.

8. Review of Work and Rejection of Defective Work:

a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.

b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

9. Inspections, Tests, and System Start-ups:

a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.

b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.

10. Records:

a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.

c. Maintain records for use in preparing Project documentation.

11. Reports:

a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.

b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.

c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.

12. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

13. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

14. Completion:

a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.

b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.

c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.

C. The RPR shall not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work.

5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.

8. Authorize Owner to occupy the Project in whole or in part.

ARTICLE 11 - AMENDING THE CONTRACT DOCUMENTS: CHANGES IN THE WORK

SC-11.04B.2

Delete paragraph 11.04B.2. of the General Conditions in its entirety.

SC-11.04C.1.

Delete paragraph 11.04C.1 of the General Conditions in its entirety.

SC-11.04C.2.b.

In paragraph 11.04C.2.b, before the semicolon add the following words "based on subcontractor's Cost of the Work";

ARTICLE 12 – CLAIMS

SC-Article 12

Delete Article 12 of the General Conditions in its entirety.

ARTICLE 13 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC-13.01B.1.

Delete the second sentence in paragraph 13.01B.1. of the General Conditions in its entirety and replace with the following:

Such employees shall include foremen at the site.

SC-13.01B.1.

Add the following new paragraph immediately after paragraph 13.01B.1. of the General Conditions which is to read as follows:

a. Following award and prior to execution of a construction contract Contractor shall establish, in the Agreement, the Direct Labor Cost percentage. This percentage, where approved by Owner, will be used in the determination of the Direct Labor Cost listed in the Change Order Form included in PART II of the Supplementary Conditions. The Direct Labor Costs are defined to include social security contributions, unemployment, excise and payroll taxes, workers' and workmen's compensation, health and retirement benefits, sick leave, vacation and holiday pay, and cost of premiums for all additional insurance required because of changes in the Work.

SC-13.02.

Delete Paragraph 13.02 of the General Conditions in its entirety.

ARTICLE 14 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

SC-14.06A.

Add the following new paragraph immediately after Paragraph 14.06A. of the General Conditions to read as follows:

B. If Owner stops Work under Paragraph 14.06A. Contractor shall not be entitled to any extension of Contract Time or increase in Contract Price.

ARTICLE 15 - PAYMENTS TO CONTRACTOR, SET-OFFS, AND COMPLETION; CORRECTION PERIOD

SC-15.01B.1.

In the first sentence of paragraph 15.01.B.1 of the General Conditions delete the number "20" and replace with the number "14".

SC-15.01B.3.

Add the following new paragraph immediately after paragraph 15.01B.3 of the General Conditions which is to read as follows:

4. Contractor shall furnish evidence that payment received on the basis of materials and equipment not incorporated and suitably stored, has in fact been paid to the respective supplier(s) within sixty days of payment by Owner. Failure to provide such evidence of payment may result in the withdrawal of previous approval(s) and removal of the cost of related materials and equipment from the next submitted Application for Payment.

SC-15.01D.1.

In paragraph 15.01D.1. of the General Conditions delete the word "Ten" and replace with the word "Thirty".

SC-15.01D.1.

Add the following new paragraphs immediately after paragraph 15.01D.1. of the General Conditions which are to read as follows:

2. Should Contractor neglect to pay any undisputed claims, made in writing to Owner within thirty days after completion of the Work, but continuing unsatisfied for a period of ninety days, Owner may pay such claim and deduct the amount thereof from the balance due Contractor. Owner may also, with the written consent of Contractor, use any monies retained, due, or to become due under this Contract for the purpose of paying for both labor and materials for the Work, for which claims have not been filed.

3. Security is provided both by the Payment Bond and the power of Owner to retain any monies for claims, but payment by one shall in no way impair or discharge the liability of the other.

4. All monies paid by Owner in settlement of liens, with the costs and expenses incurred by Owner in connection therewith, shall be charged to Contractor, shall bear interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank, and shall be deducted from the next payment due Contractor under the terms of this Contract.

SC-15.02

Add the following new paragraphs immediately after Paragraph 15.02A of the General Conditions which are to read as follows:

B. No materials or supplies for the Work shall be purchased by Contractor or Subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. Contractor warrants that Contractor has good title to all materials and supplies used by Contractor in the Work, free from all liens, claims or encumbrances.

C. Contractor shall defend, indemnify and save Owner and Engineer harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this Contract. Contractor shall at Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If Contractor fails to do so, then Owner may, after having served written notice on the said Contractor either pay unpaid bills, of which Owner has written notice, direct, or withhold from the

Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to Contractor shall be resumed, in accordance with the terms of this Contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon Owner to either Contractor or Contractor's Surety. In paying any unpaid bills of the Contractor, Owner shall be deemed the agent of Contractor and any payment so made by Owner shall be considered as payment made under the Contract by Owner to Contractor and Owner shall not be liable to Contractor for any such payment made in good faith.

SC-15.06B.1.

Delete paragraph 15.06B.1. of the General Conditions in its entirety and replace with the following:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation - all as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will indicate in writing Engineer's recommendation of payment and present the Application to Owner for payment. Thereupon Engineer will give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of paragraph 15.07. Otherwise, Engineer will return the Application to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application. If the Application and accompanying documentation are appropriate as to form and substance, Owner shall in accordance with the applicable laws and regulations, pay Contractor the amount recommended by Engineer.

ARTICLE 16 - SUSPENSION OF WORK AND TERMINATION

SC-16.02A.4.

Add the following new paragraph immediately after paragraph 16.02.A.4 of the General Conditions which is to read as follows:

5. If Contractor abandons the Work, or sublets this Contract or any part thereof, without the previous written consent of Owner, or if the Contract or any claim thereunder shall be assigned by Contractor otherwise than as herein specified;

ARTICLE 17 - FINAL RESOLUTION OF DISPUTES

SC-17.01A

Delete paragraph 17.01A.1 of the General Conditions in its entirety and replace with the following:

1. Either Owner or Contractor may request mediation of any Claim. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of this Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract.

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SC-17.01B.3.

Add a new paragraph immediately after paragraph 17.01B.3. of the General Conditions which is to read as follows:

C. Contractor shall carry on the Work and maintain the progress schedule during the dispute resolution proceedings, unless otherwise agreed by Contractor and Owner in writing.

ARTICLE 18 - MISCELLANEOUS

SC-18.08

Add the following new paragraphs immediately after Paragraph 18.08 of the General Conditions which are to read as follows:

18.09 Addresses

A. Both the address given in the Bid Form upon which this Agreement is founded, and Contractor's office at or near the site of the Work are hereby designated as places to either of which notices, letters, and other communications to Contractor shall be certified, mailed, or delivered. The delivering at the above-named place, or depositing in a postpaid wrapper directed to the first-named place, in any post office box regularly maintained by the post office department, of any notice, letter or other communication to Contractor shall be deemed sufficient service thereof upon Contractor; and the date of said service shall be the date of such delivery or mailing. The first-named address may be changed at any time by an instrument in writing, executed and acknowledged by Contractor, and delivered to Owner and Engineer. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter, or other communication upon Contractor personally.

PART 2 - FEDERAL, STATE, AND LOCAL GOVERNMENT PROVISIONS

Federal, State and Local Government Provisions included herein, have been selected from those to which specific references have been made elsewhere in the Contract Documents. Each and every other provision of law or clause required by law to be inserted in this Contract shall be deemed to be also inserted herein in accordance with Paragraph 3.01F of the Supplementary Conditions.

1.0. FEDERAL GOVERNMENT PROVISIONS

1.1. Davis Bacon Act Requirements

1.2. Federal Wage Rates

1.3. American Iron and Steel Requirements of P. L. 113-76, the Consolidated Appropriations Act of 2014

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2.0. STATE GOVERNMENT PROVISIONS

2.1. Owner and Contractor agree that the following State Government Provisions apply to the work to be performed under this Contract and that these provisions supersede any conflicting provisions of this Contract.

3.0 CITY OF BLOOMINGTON PROVISIONS
3.1 City of Bloomington, Illinois Department of Buildings code applies to work on this facility.

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4.0 ILLINOIS PREVAILING WAGE ACT AND DAVIS-BACON ACT WAGE RATES FOR MCLEAN COUNTY, ILLINOIS

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Owner's product purchase contracts.
3. Contractor's use of site and premises.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and Drawing conventions.
7. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Section 017300 "Execution" for coordination of Owner-installed products.

1.3 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. Project Generally includes the following work:

a. Installation of new Chlorine Scrubber system.
b. Decommissioning and removal of existing anhydrous ammonia feed system.
c. Installation of new anhydrous ammonia feed system.
d. HVAC and Electrical to support the Work.
e. Paving and restoration
f. and other Work indicated in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

A. Limits on Use of Site: Limit use of Project site to the Project Area. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits on Use of Site: Confine construction operations to the Project Areas as shown on the Drawings unless otherwise agreed to in writing with the Engineer or Owner.
2. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials:

    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
    c. Contractor parking shall be at the locations shown on the Drawings.

3. Water Treatment Plant: Work within the existing water treatment plant will not obstruct Owner operating personnel.

B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

D. All disturbed areas to be restored to the satisfaction of the Owner.

1.6 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy Project site and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated:

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.
3. Contractor to provide Owner with one (1) week look-ahead schedule to coordinate anticipated product and material delivery as well as general work activities and schedule.

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1.7 WORK RESTRICTIONS

A. Comply with restrictions on construction operations:

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
2. Contractor to notify all personnel requiring access to the site that this is a secured site. All deliveries, Contractor and subcontractor access, and all other access of any sort must be gained through the secured entrance by utilizing the call-box and being granted by the operator on duty.

B. On-Site Work Hours: Limit work to between 7 a.m. to 7 p.m., Monday through Friday. Work hours may be modified to meet Project requirements if approved by Owner or Engineer, and authorities having jurisdiction.

C. On-Site Work Day restrictions: Any workday restrictions will be as directed by the Engineer or the Owner. There are no known on-site workday restrictions at the time of bid.

D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:

1. Notify Engineer not less than 15 days in advance of proposed utility interruptions. See Section 011216 “Construction Sequence” for submittals.
2. Obtain Engineer's written permission before proceeding with utility interruptions.

E. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner:

1. Notify Engineer or Owner not less than two (2) days in advance of proposed disruptive operations.
2. Obtain Engineer's or Owner's written permission before proceeding with disruptive operations.

F. Site Access: Contractors will need to request access at the perimeter security gate on a daily basis. No keycards will be distributed to the Contractor to provide access.

G. Bathrooms: Contractors shall not use bathroom located in any existing building. Contractor shall provide and maintain their own temporary bathroom facilities as outlined in the Section titled “Temporary Facilities and Controls."

H. Smoking and Controlled Substance Restrictions: Use of controlled substances on Project site is not permitted. Use of tobacco products shall be at locations outside of any building and shall be in accordance with all City of Bloomington laws and ordinances.

I. Owner Requested Employee Screening: Employee screening shall be on all Contractor and Subcontractor personnel working at the site. See Section 013100:

1. Maintain list of approved screened personnel with Owner and Engineer.

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PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 011000

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SECTION 011216 – CONSTRUCTION SEQUENCE

PART 1 GENERAL

1.01 SITE CONDITIONS

A. Several areas of construction under this Contract shall be coordinated with the Engineer and accomplished in a logical order to maintain the process flow through the plant and to allow construction to be completed within the time allowed by Contract Documents. Coordinate the activities with the other contractors, if any, to allow orderly and timely completion of all the work.

B. When access through construction areas must be disrupted, provide alternate acceptable access for the plant operators or other contractors.

C. Coordinate the activities in the interface or common areas with these other contractors and the Engineer. Submit to the Owner and Engineer a description and schedule as to how the common areas will be utilized, recognizing the required coordination with other contractors and the Engineer.

D. Various interconnections within the plant may require temporary partial shutdowns. Make every effort necessary to minimize the shutdown time and coordinate with the Engineer and/or utility authorities prior to attempting any such shutdown. Furthermore, provide any corrective measure or temporary facilities necessary to perform the work at no additional cost to the Owner and without interrupting the plant operation. Approval requires Owner approval of work plan, schedule, and emergency protocols.

E. When the work requires an existing facility to be taken out of operation, temporarily or permanently, must be approved by the Engineer a minimum of 15 calendar days in advance. Owner retains the right to deny or defer activities which impact the operation of the facility based upon water consumption conditions.

F. During Start-Up Testing, make available the manpower, equipment, and manufacturer's representatives required to make any necessary adjustments and training.

1.02 SUBMITTALS

A. Submit, in accordance with Section 01 33 00, shop drawings showing details of all connections to existing systems, temporary services, bypasses, and access road interruptions. For any connections that require Owner assistance, clearly incorporate such needs into the submittal.

B. Submit details for disruptions at least 15 calendar days in advance for Engineer's review and approval. All proposed disruptions shall be subject to Engineer and Owner approval and limitations. For any outages that require Owner assistance, clearly incorporate such needs into the submittal.

C. The construction schedule required to be submitted under Section 01 32 00 shall reflect the conditions and constraints presented in this section.

1.03 NOTIFICATION REQUIREMENT

A. Following Owner approval of any aforementioned connection or disruption plans, give Owner a minimum of 15 calendar days advance notice prior to actual connection or disruption.

1.04 CONSTRUCTION CONSTRAINTS

A. The following is a list of constraints to consider in developing the overall plan of construction. This list is not intended to release the Contractor from the responsibility to coordinate the work in any manner which will ensure project completion within the time allowed. The following areas are not necessarily listed in their required sequence of construction.

1. Shutdowns will always be restrictive. However, due to higher demand periods between May 1st and September 30th, shutdowns of equipment will be more restrictive than normal.
2. A complete shutdown of all the chlorine or anhydrous ammonia gas system shall not be allowed unless approved by the Engineer.
3. Any shutdowns of the process equipment shall be coordinated with the Owner. The Owner shall designate the allowable duration of any shutdown. The durations for these shutdowns will be contingent on time of year and demands of the water treatment plan. When transferring process equipment from an existing to new equipment, equipment shall be shutdown and transferred one at a time.
4. The Contractor's temporary site security measures and equipment shall be in place prior to initiating any Project demolition work.
5. Connections to Existing Electrical Systems:

    a. All outages required to make connections to new and existing electrical systems shall be scheduled with the Owner with a minimum of 15 business days advance notice.
    b. Connections may require availability of Owner staff for switching operations. Incorporate such needs into the connection plan submitted under Paragraph 1.02.

6. Work Sequence

    a. Construct the Work associated with the new chlorine scrubber system in phases according to the following sequence:

        1) Phase 1:

            a) Construction and commissioning of new ventilation system in the Chlorine Feed Room 3-126 consisting of exhaust fan 3EF-8A and louver LV-1.
            b) Demolition of existing ventilation system serving the Chlorine Feed Room 3-126 consisting of exhaust fan 3EF-8 and associated ductwork.

        2) Phase 2:

            a) Construction and commissioning of new chlorine scrubber and ductwork serving the Chlorine Storage Room 3-119.
            b) Demolition of existing ventilation system serving the Chlorine Storage Room 3-119 consisting of exhaust fan 3EF-7 and associated ductwork.

b. Construct the Work associated with the new ammonia feed system in phases according to the following sequence:

1) Phase 1:

a) Existing ammonia feed system to remain in operation throughout Phase 1, including the existing ammonia gas regulator, ammoniator, injector, associated piping, and appurtenances. Ammonia gas supply from Ammonia Gas Storage Tank No. 2, to remain in operation to supply the existing ammonia feed system.
b) Relocate the existing heat tracing junction boxes and provide additional conduit and heat trace cable as needed to maintain a fully functional heat trace system for the existing ammonia gas supply system, as shown on the Drawings.
c) Reroute the existing downspout as shown on the drawings.
d) Remove the existing stainless steel access port and patch masonry cavity wall.
e) Repaint the existing vent pipe.

2) Phase 2:

a) Existing ammonia feed system to remain in operation throughout Phase 2, including the existing ammonia gas regulator, ammoniator, injector, associated piping, and appurtenances. Ammonia gas supply from Ammonia Gas Storage Tank No. 2, to remain in operation to supply the existing ammonia feed system.
b) Install new Ammonia Panel No. 1. Replace ammonia gas feed piping from Ammonia Gas Storage Tank No. 1, connecting to the new Ammonia Panel No. 1, including heat tracing, insulation, supports, valves, and appurtenances. Provide all utility connections to the new Ammonia Panel No. 1 including, but not limited to, plant water, ammonia solution, power, and control. Commission, test, and place the new Ammonia Panel No. 1 into operation.
c) Complete all training associated with the new ammonia feed panels.

3) Phase 3:

a) New Ammonia Panel No. 1 to remain in operation throughout Phase 3, including the new ammonia gas supply from Ammonia Gas Storage Tank No. 1.
b) Demolish the existing ammonia feed system, including the existing ammonia feed room structure.
c) Install new Ammonia Panel No. 2. Replace ammonia gas feed piping from Ammonia Gas Storage Tank No. 2, connecting to the new Ammonia Panel No. 2 and to the ammonia gas header installed under Phase 2, including heat tracing, insulation, supports, valves, and appurtenances. Provide all utility connections to the new Ammonia Panel No. 2 including, but not limited to, plant water, ammonia solution, power, and control. Commission, test, and place the new Ammonia Panel No. 2 into operation.

c. Refer to Section 01 10 00 for additional requirements.

7. Parking lot paving:

    a. Demolition of existing pavement, installation of new pavement, and associated site restoration shall be performed following the completion of the remainder of the work.

B. The partial start-up and operation of certain parts of the Work may require some, but not all, systems to be placed in operation. Owner may occupy or operate these facilities before the entire work is ready for acceptance. Such action by the Owner (or Engineer) shall not constitute acceptance of the entire area.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF 011216

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SECTION 012001 - PRICE AND PAYMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Lump sum prices.

1.2 LUMP SUM PRICES

A. Lump sum measurement for payment will be for the entire item, unit of work, structure, or combination thereof, as specified and as indicated on the Bid Form. Payment for all items indicated as Lump Sum shall include the cost of all labor, materials and equipment necessary to furnish, install, clean, test, and place each bid item into operation; including permitting, general conditions, overhead, and profit. All Bloomington Department of Building permits and all other permits shall be included in the lump sum base bid price as well as the cost for all material testing and all other testing included in these Contract Documents.

B. Progress payments will be based on the Schedule of Values prepared by the Contractor and approved by the Engineer and Owner (Section 012900 "Payment Procedures") before acceptance of the first Application for Payment.

C. In order to for the Contractor to request progress payments against lump sum items, the Contractor shall provide a disaggregation or breakdown in sufficient measurable detail that is acceptable to the Engineer.

D. Measurement shall be based on the estimate percent complete for each item of the Schedule of Values, as determined by the Engineer.

E. Payment of the lump sum price shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary for constructing the items included in the Contract Price approved by the Owner in Section 005214.16 "Agreement." Complete, as shown and as specified in Divisions 01 through 40 and on the Drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 BASE BID

A. This item is intended to cover all work in the Contract Documents other than the Allowances including disconnect from the existing anhydrous ammonia system to allow for a fully functioning new chlorine scrubber and anhydrous ammonia system.

B. Measurement

1. Lump sum per the schedule of values. See Section 012900.

C. Payment

1. Lump sum per the schedule of values. See Section 012900.

END OF SECTION 012001

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SECTION 012100 - CONTINGENCY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing the use of contingency when performing the Work.

B. Types of contingencies include the following:

1. Lump-sum contingencies.

C. Related Requirements:
1. Section 012600 “Contract Modification Procedures” for procedures for submitting and handling Change Orders.
2. Section 014000 "Quality Requirements" for procedures governing the use of contingencies for field testing by an independent testing agency.

1.3 DEFINITIONS

A. Contingency: A quantity of work or dollar amount included in the Contract, but exclusive of the work shown in the Contract Documents for which payment is included under other items in the Bid Form. Contingency is used by the Owner to pay for unanticipated costs associated with investigative work or unforeseen conditions which may occur during performance of the work. Contingency will be authorized by field order and is to be used only as needed at the direction of the Owner or Engineer. All unused balance of Contingency shall be returned to the Owner upon completion of the work.

1.4 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Engineer of the date when final selection, or purchase and delivery, of each service, product or system described by Contingency (when applicable) must be approved by the Owner or Engineer to avoid delaying the Work.

B. Purchase products and services selected by Engineer from the designated supplier.

1.5 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.6 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of the work.

1.7 LUMP-SUM CONTINGENCY

A. Contingency shall include cost to Contractor of specific products and materials ordered by Owner or selected by Engineer and shall include taxes, freight and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Engineer under contingency shall be included as part of the Contract Sum and not part of the Contingency.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by Contingency promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation with related materials and installations to ensure that each item is completely integrated and interfaced with related work.

3.3 CONTINGENCY PROCEDURES

A. When Work, not shown on the Contract Documents, is determined to be required to complete work shown on the Contract Documents, Contractor shall give notice to the Engineer. If Work is determined by the Engineer to be applicable under the definition of Contingency included in this Section, the following procedures shall be followed:
   1. Owner and Engineer shall review project documents and determine what work, if any, is outside of the current scope of work.
   2. The Owner reserves the right to contract any and all contingency work to Others should the Owner chose to.

3. Engineer shall issue a Field Order that includes documentation supporting the use of Contingency funds. Field Order is to provide sufficient guidance to the Contractor to complete the additional work identified as being eligible for the Contingency.
4. The contractor shall submit a Change Proposal to the Engineer in accordance with Article 11.09 of the General Conditions.
5. Costs for work completed as part of an accepted Change Proposal shall be included and identified in subsequent Payment Application under the Contingency line item in the Schedule of Values.

B. Any work determined to require use of Contingency funds,outside of the limit of the project documents, and completed prior to acceptance of the Change Proposal shall be solely performed at the Contractor's risk.

END OF SECTION 012100

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SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form acceptable to Engineer.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of Engineers and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 15 calendar days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Engineer's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Engineer will consider requests for substitution if received within **60** days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Engineer.

1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.

f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012500

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SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
2. Section 013100 “Project Management and Coordination” for requirements for forms for contract modifications provided as part of web-based Project management software.

1.3 MINOR CHANGES IN THE WORK

A. Engineer will issue Field Orders authorizing minor changes in the Work, not involving adjustment to the Contract Price or the Contract Time, on EJCDC Form C-942.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Price or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Requests For Proposal (RFP) issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
2. Within 20 days after receipt of RFP, submit a quotation estimating adjustments to the Contract Price and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and

finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

e. Quotation Form: Use forms acceptable to Engineer.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Engineer.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Price and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Engineer.

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Change Order Request, Engineer will issue a Change Order for signatures of Owner and Contractor on EJCDC Form C-941.

1.7 WORK CHANGE DIRECTIVE

A. Work Change Directive: Engineer may issue a Work Change Directive on EJCDC Document C-940. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Price or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.

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1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012600

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Section 012600 "Contract Change Procedures" for administrative procedures for handling changes to the Contract.
   2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

   1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Engineer at earliest possible date, but no later than ten days before the date scheduled for submittal of initial Applications for Payment.
   3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
   4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
   5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract, as described in Section 011000 "Summary."

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.
b. Owner's name.
c. Owner's Project number.
d. Name of Engineer.
e. Engineer's Project number.
f. Contractor's name and address.
g. Date of submittal.

2. Arrange schedule of values consistent with format of EJCDC Document C-620.
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:

a. Related Specification Section or division.
b. Description of the Work.
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.

1) Labor.
2) Materials.
3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent (5%) of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
6. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
7. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.

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B. Payment Application Times: Submit Application for Payment to Engineer by the 5th calendar day of the month. The period covered by each Application for Payment is one month, ending on the last day of the previous month.

1. Submit draft copy of Application for Payment seven (7) calendar days prior to due date for review by Engineer.

C. Application for Payment Forms: Use EJCDC Document C-620 as form for Applications for Payment.

1. Other Application for Payment forms proposed by the Contractor may be acceptable to Engineer and Owner. Submit forms for approval with initial submittal of schedule of values.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit two signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt within 2 calendar days. One copy shall include waivers of lien and similar attachments..

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Maintain an updated set of drawings to be used as record drawings in accordance with Section 017839. As a prerequisite for monthly progress payments, exhibit the updated record drawings for review by Owner and Engineer for completeness and accuracy.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule.
4. Products list (preliminary if not final).
5. List of Contractor's staff assignments.
6. List of Contractor's principal consultants.
7. Copies of building permits.
8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
9. Initial progress report.
10. Report of preconstruction conference.

I. Application for Payment at Substantial Completion: After Engineer issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

    a. Complete administrative actions, submittals, and Work proceeding this application, as described in Section 017700 "Closeout Procedures."

2. Include initial submittal of closeout record drawings in accordance with Section 017839.
3. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Final submittal of closeout record drawings in accordance with Section 017839.
5. Updated final statement, accounting for final changes to the Contract Sum.
6. AIA Document G706.
7. AIA Document G706A.
8. AIA Document G707.
9. Evidence that claims have been settled.
10. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
11. Final liquidated damages settlement statement.

12. Proof that taxes, fees, and similar obligations are paid.
13. All other documents provided in Section 15.06 of the Standard General Conditions of the Construction Contract.
14. Waivers and releases.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Project meetings.

B. Each subcontractor to the contractor shall participate in coordination requirements.

C. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.
4. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.3 DEFINITIONS

A. RFI: Request for Information. Request from Owner, Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Personnel Names: Within 15 days of starting construction operations, submit a list of all contractor and subcontractor individuals including personnel assignments, including superintendent and other personnel in attendance at Project site and requiring access. Identify their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project. Provide background check information obtained by an authorized company that performs this type of service. At a minimum, the background check shall include verification of State of Illinois or Federal offenses. If any employee has convictions, Owner reserves the right to reject access to the site for that individual.

1. Keep list current at all times.
2. Background check for all employees.

C. Main Entrance Sign: See Section 011000. Submit sign with dimensions to Engineer. Following approval, Contractor to install sign. See Section 011000, Part 1.07.A.4 for wording of sign.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Engineer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
3. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
4. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

5. Electrical Work: Show the following:

a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
d. Location of pull boxes and junction boxes, dimensioned from column center lines.

6. Review: Engineer will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Engineer determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Engineer will so inform Contractor, who shall make suitable modifications and resubmit.
7. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

C. Coordination Drawing Process: Prepare coordination drawings in the following manner:

1. Schedule submittal and review HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
3. Installer shall forward drawing files to Electrical Installer.
4. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
5. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
6. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.

D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Preparation Format: DWG, Version Current operating in Microsoft Windows operating system.
3. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format. Also include PDF format.

1.7 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Engineer will return without response those RFIs submitted to Engineer by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner name.
3. Owner's Project number.
4. Name of Engineer
5. Date.
6. Name of Contractor.
7. RFI number, numbered sequentially.
8. RFI subject.

9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
13. Contractor's signature.
14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 attached to this Section.

1. Attachments shall be electronic files in PDF format.

D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Engineer's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt by Engineer of additional information.
3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Change Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within **5** days of receipt of the RFI response.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Engineer's Digital Data Files: Select digital data files of Engineer's electronic drawings will be provided by Engineer for Contractor's use during construction when Contractor requests these files by submitting an RFI.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
2. Engineer makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Contractor shall execute a data licensing Agreement provided by the Engineer.

    a. Subcontractors, and other parties granted access by Contractor to Engineer's digital data files shall execute a data licensing agreement in the form provided by the Engineer.

B. Web-Based Project Management Software Package: Use Contractor's web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion. General Contractor shall be responsible for the full cost for the web-based project management software for the complete access of the project team including costs for Owner, Engineer, Contractor, subcontractors and suppliers.

1. Web-based Project management software includes, at a minimum, the following features:

    a. Compilation of Project data, including Contractor, subcontractors, Engineer, Owner, and other entities involved in Project. Include names of individuals and contact information.
    b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
    c. Document workflow planning, allowing customization of workflow between project entities.
    d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
    e. Documenting payment applications.
    f. Documenting contract modifications.
    g. Creating and distributing meeting minutes.
    h. Document management for Drawings, Specifications, and coordination drawings, including revision control.
    i. Management of construction progress photographs.

C. PDF Document Preparation: Where PDFs are required to be submitted to Engineer, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

A. General: Engineer will schedule and conduct project meetings at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. For meetings other than Monthly Project Meetings, Notify Owner and Engineer of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Engineer will record significant discussions and agreements achieved. Engineer shall distribute the meeting minutes to everyone concerned, including Owner and Contractor, within six calendar days of the meeting.

B. Preconstruction Conference: Engineer will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than 30 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Responsibilities and personnel assignments.
    b. Tentative construction schedule.
    c. Phasing.
    d. Critical work sequencing and long lead items.
    e. Pre-procurement contract and update.
    f. Designation of key personnel and their duties.
    g. Lines of communications.
    h. Use of web-based Project software.
    i. Procedures for processing field decisions and Change Orders.
    j. Procedures for RFIs.
    k. Procedures for testing and inspecting.
    l. Procedures for processing Applications for Payment.
    m. Distribution of the Contract Documents.
    n. Submittal procedures.
    o. Sustainable design requirements.
    p. Preparation of Record Documents.
    q. Use of the premises and existing buildings.
    r. Work restrictions.
    s. Working hours.
    t. Owner's occupancy requirements.
    u. Responsibility for temporary facilities and controls.
    v. Procedures for moisture and mold control.
    w. Procedures for disruptions and shutdowns.
    x. Construction waste management and recycling.
    y. Parking availability.
    z. Office, work, and storage areas.
    aa. Equipment deliveries and priorities.
    bb. First aid.
    cc. Security.
    dd. Progress cleaning.
    ee. List of major subcontractors and suppliers.

3. Minutes: Engineer will record and distribute meeting minutes.

C. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Engineer, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of Record Documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Procedures for completing and archiving web-based Project software site data files.
    d. Submittal of written warranties.
    e. Requirements for completing sustainable design documentation.
    f. Requirements for preparing operations and maintenance data.
    g. Requirements for delivery of material samples, attic stock, and spare parts.
    h. Requirements for demonstration and training.
    i. Preparation of Contractor's punch list.
    j. Procedures for processing Applications for Payment at Substantial Completion and for final payment including final change order.
    k. Submittal procedures.
    l. Coordination of separate contracts.
    m. Owner's partial occupancy requirements including certificate of occupancy and closeout of permits.
    n. Installation of Owner's furniture, fixtures, and equipment.
    o. Responsibility for removing temporary facilities and controls.
    p. Final cleaning.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

D. Progress Meetings: progress meetings on a monthly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Status of sustainable design documentation.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site use.
9) Temporary facilities and controls.
10) Progress cleaning.
11) Quality and work standards.
12) Status of correction of deficient items.
13) Field observations.
14) Status of RFIs.
15) Status of Proposal Requests.
16) Pending changes.
17) Status of Change Orders.
18) Pending claims and disputes.
19) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Coordination Meetings: Conduct project coordination meetings at Contractor-determined intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site use.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Status of RFIs.
14) Proposal Requests.
15) Change Orders.
16) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.

B. Related Requirements:

1. Section 014000 "Quality Requirements" for schedule of tests and inspections.
2. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file.
2. PDF file.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Engineer's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including pre-purchase, phasing, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.

11. Review procedures for updating schedule.
12. Submit at this conference a preliminary network defining the planned operation during the first 60 calendar days after the Notice to Proceed.

1.6 Contractor's CONSTRUCTION SCHEDULE

A. Program Description

1. A Critical Path Method (CPM) construction schedule shall be used to control the Work and to provide a basis for determining job progress. The construction schedule shall be prepared and maintained by the Contractor. All work shall be done in accordance with the established CPM schedule. The Contractor and all subcontractors shall cooperate fully in developing the construction schedule and in executing the work in accordance with the CPM schedule.
2. The construction schedule shall consist of a computerized CPM network (diagram of activities) presented in a time-scaled graphic (print-out) with reports, as specified herein.

B. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Use Microsoft Project for current Windows operating system unless another Computer Scheduling software approved by the Engineer.

C. Qualifications:

1. The Contractor shall have the capability of preparing and utilizing the specified CPM schedule, or engage the services of a specialized scheduling professional to do so.

D. Time Frame: Extend schedule from date established for the Notice to Proceed to dates that include both Substantial Completion and Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

E. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 calendar days, unless specifically allowed by Engineer.
2. Activities to facilitate the Work: Indicate start and completion dates for the following as applicable:

    a. Securing of approvals and permits required for performance of the Work.
    b. Temporary facilities.
    c. Construction of mock-ups, prototypes and samples.
    d. Owner interfaces and furnishing of items.
    e. Interfaces with Separate Contracts.
    f. Regulatory agency approvals.
    g. Punch list.

3. Procurement Activities: Include procurement process activities for the long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
5. Startup and Testing Time: Include approximate number of days for startup and testing.
6. Commissioning Time: Include no fewer than **20 days** for commissioning.
7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.
8. Punch List and Final Completion: Include no fewer than **30** days for completion of punch list items and Final Completion.

F. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary" or included in project meeting minutes. Delivery dates indicated stipulate the earliest possible delivery date.
3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Restrictions: Show the effect of work restriction such as the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use-of-premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Deliveries.
    b. Installation.
    c. Tests and inspections.
    d. Startup and placement into final use and operation.
    e. Commissioning.

6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.

b. Temporary enclosure and space conditioning.
c. Permanent space enclosure.
d. Completion of mechanical installation.
e. Completion of electrical installation.
f. Substantial Completion.

7. Other Constraints: Insert constraints not indicated elsewhere into the schedule.

G. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

H. Acceptability

1. Submit the CPM schedule submittals, as specified, and resubmit as needed, until they are in compliance with Contract requirements.
2. The Engineer's review of the Contractor's construction schedule submittals will only be for conformance with the Contract requirements – including but not limited to contract time and work sequences specified in the contract documents. The Engineer's review of the schedule shall not include the Contractor's means and methods of construction or safety. The Engineer's concurrence, acceptance, or approval of the Contractor's schedule submittals will not relieve the Contractor from responsibility for complying with the Contract Scope, Contract Time or any other contract requirement. Any indication of concurrence, acceptance, or approval of the Contractor's schedule will only indicate a general conformance with the Contract Requirements.
3. Failure to include any element of work required for the performance of this Contract will not excuse the Contractor from completing all Work required within the Contract completion date(s), notwithstanding the review of the network by the Engineer.
4. CPM schedules that contain activities with negative float, or which extend beyond the contract completion date, will not be acceptable.
5. Except where earlier completions are specified, CPM schedules which show completion of all work prior to the contract completion date may be indicated; however, in no event shall they constitute a basis for claim for delay by the Contractor.

I. Contractor's Construction Schedule Updating: Update schedule and include with pay applications to reflect actual construction progress and activities.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a brief summary report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Final Completion percentage for each activity. Activities shall not be considered to be complete until they are in fact 100 percent complete.
4. Submit a brief narrative report based on the CPM schedule evaluation, in a format agreed upon by the Contractor and the Engineer. The report shall include a description of the progress during the previous period in terms of completed activities, an explanation of each activity which is showing a delay, a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates and an explanation of corrective action taken or proposed.

J. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

K. The contract completion time will be adjusted only for causes specified in this Contract. In the event the Contractor requests an extension of any contract completion date, the Contractor shall furnish such justification and supporting evidence as the Engineer may deem necessary to determine whether the Contractor is entitled to an extension of time under the provisions of this Contract. The Engineer will, after receipt of such justification and supporting evidence, make findings of fact and will advise the Contractor in writing thereof. If the Engineer finds that the Contractor is entitled to any extension of any contract completion date, the Engineer determination as to the total number of days extension shall be based upon the currently approved CPM schedule and on all data relevant to the extension. Such data shall be included in the next updating of the schedule. Actual delays in activities which, according to the CPM schedule, do not affect any contract completion date shown by the critical path in the network will not be the basis for a change therein.

L. Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.7 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within 30 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.8 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.

1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

PART 2 - EXECUTION (NOT USED)

END OF SECTION 013200

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SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Concealed Work photographs.
3. Periodic construction photographs.
4. Final Completion construction photographs.
5. Preconstruction video recordings.
6. Periodic construction video recordings.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
2. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
3. Section 024119 "Selective Demolition" for photographic documentation before selective demolition operations commence.
4. Section 311000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.3 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within seven days of taking photographs:

1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description in web-based Project management software site:

a. Name of Project.
b. Name and contact information for photographer.

c. Name of Engineer.
d. Name of Contractor.
e. Date photograph was taken.
f. Description of location, vantage point, and direction.
g. Unique sequential identifier keyed to accompanying key plan.

C. Video Recordings: Submit video recordings within seven days of recording:

1. Submit video recordings by uploading to web-based Project management software site. Include copy of key plan indicating each video's location and direction.
2. Identification: With each submittal, provide the following information on web-based Project management software site:

a. Name of Project.
b. Name and address of photographer.
c. Name of Engineer that produced the Contract Documents (i.e. CDM Smith)
d. Name of Contractor.
e. Date video recording was recorded.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

3. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy duty, three-ring vinyl covered binders. Provide label on front and spine. Include a cover sheet with label information. Include name of Project and date of video recording on each page.

1.4 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.5 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full high-definition mode with vibration-reduction technology. Provide supplemental lighting in low light levels or backlit conditions.

C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

D. Metadata: Record accurate date and time from camera.

E. File Names: Name media files with date, location, and sequential numbering suffix.

F. Usage Rights:

1. Obtain and transfer copyright usage rights from photographer and videographer to Owner for unlimited reproduction of photographic and videographic documentation.

1.6 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs with maximum depth of field and in focus:

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Preconstruction Photographs: Before commencement of the Work take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Engineer:

1. Flag excavation areas, project limits, interior areas, and other areas of note before taking construction photographs.
2. Take at least 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 10 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. Underground utilities.
2. Underslab services.
3. Piping.
4. Waterproofing and weather-resistant barriers.

E. Periodic Construction Photographs: Take at least 20 photographs monthly. Select vantage points to show status of construction and progress since last photographs were taken. Periodic construction photographs do not need to be obtained by a professional photographer.

F. Final Completion Construction Photographs: Take at least 20 photographs after date of Substantial Completion for submission as Project Record Documents. Engineer will inform photographer of desired vantage points.

1.7 CONSTRUCTION VIDEO RECORDINGS

A. Video Recording Photographer: Engage a qualified videographer with not less than three years' experience to record construction video recordings.

B. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction:

1. Confirm date and time at beginning and end of recording.
2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.

C. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video recording opposite the corresponding narration segment.

D. Preconstruction Video Recording: Before starting any Work, record video recording of Project site, interior building, and surrounding properties from different vantage points, as directed by Engineer:

1. Flag construction limits before recording construction video recordings.
2. Show existing conditions adjacent to Project site before starting the Work.
3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of the Work. Pay special attention to foundations and walls inside existing buildings.
4. Show protection efforts by Contractor.
5. Frequency: During each of the following construction phases, set up video recorder to automatically record one frame of video recording every five minutes, from same vantage point each time, to create a time-lapse sequence of 60 minutes in length as follows:

    a. Above-grade structural framing.
    b. Exterior building enclosure.

6. Timer: Provide timer to automatically start and stop video recorder, so recording occurs only during daylight hours.
7. Vantage Points: Following suggestions by Engineer and Contractor, photographer shall select vantage points.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013233

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SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
5. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
6. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
7. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
8. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
9. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with

requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Mass Submittals: Six or more submittals or items in one day or 10 or more submittals or items in one week.

1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Engineer's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled date of fabrication.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL FORMATS

A. Numbering System: Utilize the following example submittal identification numbering system to identify submittals and as file names for PDF submissions:

1. First Identifier - Alphabet Character: D, S, M or I which represents Shop Drawing (including working drawings and product data), Sample, Manual (Operating & Maintenance) or Informational, respectively.
2. Second Identifier - Next 6 or 8 Digits: Applicable Specification Section Number. Do not mix submittals from different specification sections into a single submittal.

3. Third Identifier - Next Three Digits: Sequential number of each separate item or drawing submitted under each Specification Section, in chronological order submitted, starting at 001.
4. Fourth Identifier - Last Alphabet Character: A to Z, indicating the submission (or resubmission) of the same submittal, i.e., "A" = 1st submission, "B" = 2nd submission, "C" = 3rd submission, etc.
5. EXAMPLE: D-033000.13-008-B.

    a. D = Shop Drawing.
    b. 03 30 00.13 = Section; use only 6 digits for sections that do not include 8 digits.
    c. 008 = the eighth different submittal under this Section.
    d. B = the second submission (first resubmission) of that particular shop drawing.

B. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Engineer.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.
7. Names of subcontractor, manufacturer, and supplier.
8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
9. Category and type of submittal.
10. Submittal purpose and description.
11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
12. Drawing number and detail references, as appropriate.
13. Indication of full or partial submittal.
14. Location(s) where product is to be installed, as appropriate.
15. Other necessary identification.
16. Remarks.
17. Signature of transmitter.

C. Options: Identify options requiring selection by Engineer.

D. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Engineer on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

E. Paper Submittals:

1. Paper submittals shall only be submitted when requested. All submittals shall be electronic unless paper submittals specifically requested by the Engineer.
2. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
3. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.

4. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Engineer will return one copy.
5. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Engineer will not return copies.
6. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
7. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using Contractor's transmittal form.

F. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal. Email Engineer and Owner immediately after submittals are uploaded.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal (and 30 days for multi-discipline reviews). Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.
4. Repetitive Reviews: Shop drawings, O&M manuals, and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at the Contractor's expense. Reimburse the Owner for all costs invoiced by Engineer for the third and subsequent reviews.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

1.7 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

    a. Project name and submittal number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.
    e. Number and title of applicable Specification Section.
    f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record. Transmittals submitted by email shall also be uploaded to the web-based project management software.
4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer will return submittal with options selected.

7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit three sets of Samples. Engineer will retain two Sample sets; remainder will be returned.

      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Insert definition of Contractor certificates here if required by individual Specification Sections. See the Evaluations.

3. Contractor's Certification: Each shop drawing, working drawing, product data, and sample shall have affixed to it the following Certification Statement:

    a. "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements. "

4. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
5. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
6. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
7. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
8. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.

e. Description of product.
f. Test procedures and results.
g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and two (2) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 PROPOSED PRODUCT LIST

A. Within 45 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.10 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.

B. Contractor Responsible for:

1. Determination and verification of materials including manufacturer's catalog numbers.
2. Determination and verification of field measurements and field construction criteria.
3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
4. Determination of accuracy and completeness of dimensions and quantities.
5. Confirmation and coordination of dimensions and field conditions at Site.
6. Construction means, techniques, sequences, and procedures.
7. Safety precautions.
8. Coordination and performance of Work of all trades.

9. Other requirements enumerated in Contract Documents.

C. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Engineer will not review submittals received from Contractor that do not have Contractor's review and approval.

1.11 ENGINEER'S REVIEW

A. Do not make mass submittals to Engineer. If mass submittals are received, Engineer's review time stated above will be extended as necessary to perform proper review. Engineer will review mass submittals based on priority determined by Engineer after consultation with Owner and Contractor.

B. Action Submittals: Engineer will review each submittal, indicate corrections or revisions required, and return.

1. PDF Submittals: Engineer will indicate, via markup on each submittal, the appropriate action.
2. Submittals by Web-Based Project Management Software: Engineer will indicate on submittal cover sheet, on Project management software website, the appropriate action.

C. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.

E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

F. Engineer will return without review submittals received from sources other than Contractor.

G. Submittals not required by the Contract Documents will be returned by Engineer without action.

H. Shop drawings will be returned to the Contractor with one of the following codes.

1. "APPROVED" - This code is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.
2. "APPROVED AS NOTED" - This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
3. "APPROVED AS NOTED/RESUBMIT" - This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package.

The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. The resubmittal is to address all comments, omissions and non-conforming items that were noted. An additional box is checked to indicate whether the resubmission is for the complete package, or for parts of the package. If no box is checked, a complete resubmittal shall be provided. Review code may designate if a partial or full submittal is required. If full submittal is required, a complete resubmittal package addressing all comments shall be provided. If a partial submittal is designated, resubmittal shall only include information pertaining to those items noted in review comments requiring clarification and any portions of submittal impacted as a result of the response. Resubmittal is to be received by the Engineer within 30 calendar days of the date of the Engineer's transmittal requiring the resubmittal.

4. "REJECTED" - This code is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the requirements of the Contract Documents.
5. "RECEIPT ACKNOWLEDGED (Not subject to Engineer's Approval)" - This code is assigned to acknowledge receipt of a submittal that is not subject to the Engineer's approval. This code is generally used with submittals involving the Contractor's means and methods of construction work plans, and health and safety plans.

1.12 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

A. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.

B. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:

1. Use of files is solely at receiver's risk. Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Engineer of discrepancy and use information in hard-copy Drawings and Specifications.
2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.
3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.
4. Receiver shall not hold Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
5. Receiver shall understand that even though Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
6. Receiver shall not hold Engineer responsible for such viruses or their consequences, and shall hold Engineer/Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

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PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013300

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SECTION 013529 – SAFETY, HEALTH, AND EMERGENCY RESPONSE PLAN REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following:

1. Utilize the services of a health and safety professional designated the Site Safety and Health Officer (SSHO) to develop and implement the Safety, Health, and Emergency Response Plan (SHERP) conduct initial site-specific training, and provide support for all health and safety activities as needed, including the upgrading or downgrading of the level of personnel protection:

a. The SSHO shall perform the continued implementation and enforcement of the SHERP. The SSHO shall be assigned to the site on a full-time basis and shall be either the Contractor's employee or a subcontractor who reports to the Contractor and the SSHO in matters pertaining to site safety and health.

1.3 DEFINITIONS

A. Site Safety and Health Officer (SSHO): The employee assigned to the site on a full-time basis for the duration of the project with functional responsibility for implementation of the SHERP.

B. Physician: A licensed physician with experience in the practice of occupational medicine.

1.4 SITE SAFETY AND HEALTH OFFICER

A. The Site Safety and Health Officer (SSHO) shall perform daily implementation and enforcement of the SHERP. The SSHO shall be assigned to the site on a full-time basis, and shall report to the Contractor pertaining to site safety and health. The SSHO shall be responsible for preparing and maintaining HMH&S site logs and reports:

1. The qualifications of the SSHO shall include:

a. A working knowledge of Federal and State safety and health regulations.
b. Current certification in first aid and cardiopulmonary resuscitation (CPR) by a recognized approved organization such as the American Red Cross.
c. 40-hour OSHA training, annual refresher training, and medical monitoring training.

2. The name, the qualifications (education summary and documentation), and the work experience of the SSHO shall be submitted to the Engineer for review, prior to the commencement of work at the site.

B. Source quality-control reports.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

1.6 MAINTENANCE MATERIAL SUBMITTALS

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: See Appendix C requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

1.9 REGULATORY REQUIREMENTS AND APPLICABLE PUBLICATIONS

A. Provide a specific SHERP consistent with the requirements of the following:

1. Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926
2. United States Environmental Protection Agency (USEPA) Standards and Regulations contained in Title 40 Parts
3. NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Site Activities

B. SHERP: Provide, but not necessarily be limited to, the following components as required by OSHA 29 CFR 1910.120(i)(2):

1. Names of key personnel and alternates responsible for site safety and health (responsibilities and chain of command).
2. Safety and health hazard assessment and risk analysis for each site task and operation (Accident Prevention Plan).
3. Site Description and Evaluation.
4. Education and Training.
5. Personnel Protective Equipment.
6. Medical Surveillance.
7. Standard Operating Procedures, Engineering Controls and Work Practices.
8. Site Control Measures (Work Zones, Communications and Security).
9. Emergency Equipment and First Aid Requirements.
10. Emergency Response Plan and Contingency Procedures.
11. Heat/Cold Stress Monitoring.
12. Logs, Reports and Record Keeping.

C. The SHERP shall be submitted to the Engineer within 7 days following the Effective Date of the Agreement and must be approved prior to commencement of any on-site work.

D. Determination of the appropriate level of worker safety equipment and procedures shall be made by the Contractor as a result of initial site survey review of existing data and a continued safety and health monitoring program performed by the SSHO and approved by the Engineer, in accordance with the requirements specified herein.

E. Standards delineated in this Section are in addition to or an amplification of procedures and requirements of the above referenced regulations and documents.

F. Should any unforeseen or site-specific safety related factor, hazard, or condition become evident during the performance of work at this site, it shall be the Contractor's responsibility to bring such to the attention of the Engineer both verbally and in writing as quickly as possible, for resolution. In the interim, the Contractor shall take prudent action to establish and maintain safe working conditions and to safeguard employees, the public and the environment.

G. Should the Contractor seek relief from, or substitution for, any portion or provision of the SHERP, such relief or substitution shall be requested of the Engineer in writing and if approved, be authorized in writing.

H. The SHERP developed by the Contractor shall include provisions for work related to initial site preparation prior to implementation of the facilities described in this Contract. It shall be the responsibility of the Contractor to conduct whatever testing and monitoring is deemed necessary to assure a safe operation during the initial site preparation work.

1.10 SITE CONTROL

A. Work Zones/Project Limits:

1. Clearly layout and identify the Project Limits in the field and limit equipment, operations and personnel in the Project Limits as required by this Section.

B. Communications:

1. Provide portable two-way radio or portable vehicle telephone communication at the site and emergency numbers, including police, fire, ambulance, hospital and Owner, shall be prominently posted near the radio or telephone.

C. Security:

1. Visible identifiers shall be provided within work zones at the site and maintained 24 hours per day for the duration of the work in order to restrict unauthorized access to these areas. Specific components of this security operation are as follows:

    a. Vehicular access to all fenced areas shall be restricted to authorized vehicles only.
    b. Maintain a log of security incidents.
    c. Require visitors having access to sign-in and sign-out and shall keep a record of all site access other than Owner or Engineer personnel.

d. All approved visitors shall be briefed on safety and security and escorted by the Contractor SSHO throughout their visit.
e. Sufficient lighting shall be provided to ensure effective night security at the site.

1.11 TRAINING

A. Certify that all personnel assigned to or regularly entering the site for the purpose of performing or supervising work, for health, safety, security, or administrative purposes, for maintenance, or for any other site-related function, have received appropriate safety training.

B. Documentation certifying this retraining of personnel shall be furnished to the Engineer.

C. Additionally, guarantee that, personnel not successfully completing the required training are not permitted to enter the site to perform work.

1.12 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

A. Develop contingency plans including evacuation procedures and routes to places of refuge or safe distances from the danger area, for the following potential emergencies: chemical exposure, personal injury, potential or actual fire or explosion, and environmental accident (spill or release). In the event of any emergency associated with remedial action, without delay: take diligent action to remove or otherwise minimize the cause of the emergency; alert the Engineer and institute whatever measures might be necessary to prevent any repetition of the conditions or actions leading to, or resulting in, the emergency.

B. Emergency medical care services shall be prearranged at a nearby medical facility with established emergency routes. The staff at the facility shall be advised of the potential medical emergencies that might result.

C. Establish emergency communications with health and emergency services. The name of this facility, name of contact, emergency routes and emergency communications arrangements shall be provided in the SHERP. In addition, the Contractor shall provide the following equipment:

1. At least one first aid kit shall be provided and maintained fully stocked at a first aid station which is in close proximity to the work, but not inside a hazardous work area. First aid kit locations shall be specially marked and provided with adequate water and other supplies necessary to cleanse and decontaminate burns, wounds, or lesions.
2. Have at least one Contractor-designated First Aid Technician on the site at any time there is work being performed. This person may perform other duties but must be immediately available to render first aid when needed.
3. 2A-10 B:C type dry chemical fire extinguishers shall be provided at the site office.

1.13 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

A. Develop an emergency response and contingency plan for on-site and off-site emergencies, as specified in OSHA 29 CFR 1910.120(l), which shall address at a minimum:

1. Pre-emergency planning

2. Personnel roles, lines of authority, training and communication
3. Emergency recognition and prevention
4. Safe distances and places of refuge
5. Site security and control
6. Evacuation routes and procedures
7. Emergency medical treatment and first aid
8. Emergency alerting and response procedures
9. Critique of response and follow-up

B. In the event of any emergency associated with Response Action, without delay: take diligent action to remove or otherwise minimize the cause of the emergency; alert the Engineer and institute whatever measures might be necessary to prevent any repetition of the conditions or actions leading to, or resulting in, the emergency.

C. Emergency medical care services shall be prearranged at a nearby medical facility with established emergency routes. The staff at the facility shall be advised of the potential medical emergencies that might result and that the patients clothing, and skin might be contaminated.

D. Establish emergency communications with health and emergency services. The name of this facility, name of contact, emergency routes and emergency communications arrangements shall be posted at the site. The posted list shall include the following minimum points:

1. Contractor physician name, address and telephone number.
2. Ambulance service and fire department telephone numbers.
3. Procedure for prompt notification of Engineer.

E. In the event that an accident for some other safety related incident occurs during the course of the project, the Engineer shall be telephoned immediately and receive a written notification within 24 hours. The report shall include the following items:

1. Name, organization, telephone number, and location of the Contractor.
2. Name and title of the person(s) reporting.
3. Date and time of accident/incident.
4. Location of accident/incident, including site location and facility name.
5. Brief summary of accident/incident giving pertinent details including type of operation ongoing at time of accident.
6. Cause of accident/incident, if known.
7. Casualties (fatalities, disabling injuries).
8. Details of any existing chemical hazard or contamination.
9. Estimated property damage, if applicable.
10. Nature of damage; effect on contract schedule.
11. Action taken by Contractor to ensure safety and security.
12. Other damage or injuries sustained (public or private).
13. Completion of Exhibit V-4 in Appendix C.

1.14 PERSONAL PROTECTIVE EQUIPMENT

A. Provide all on-site personnel with appropriate personal safety equipment and protective clothing, and ensure that all safety equipment and protective clothing is kept clean and well maintained. The Contractor's SSHO shall establish upgrade/downgrade "action levels" from the

specified minimum levels of protection based upon air monitoring results and direct contact potential. Protocols formally changing the level of protection and the communication network for doing so shall be described in the SHERP. Any changes to the minimum level of protection shall be approved by the SSHO and the Engineer. At a minimum the following items shall be provided:

1. Protective clothing shall be furnished for on-site personnel, consisting of:

    a. Level D: use as appropriate:

        1) Coveralls/Jeans
        2) Gloves
        3) Boots/shoes, steel toe and shank
        4) Boots, outer, (disposable)
        5) Safety glasses
        6) Hard hat
        7) Escape mask. Optional as applicable
        8) Face shield. Optional as applicable
        9) Face mask. Per current recommendations from the Center for Disease Control and Prevention (CDC)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 Should any conflict between this Section, Contractor shall request a written resolution by the Engineer.

END OF SECTION 013529

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
4. Contractor shall pay for all testing services.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

A. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

B. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

C. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."

E. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

F. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Engineer.

1.4 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated-Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Engineer regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Engineer for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.6 ACTION SUBMITTALS (NOT USED)

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

E. Reports: Prepare and submit certified written reports and documents as specified.

F. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Engineer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include Work Engineer has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.10 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed

for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged in the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect, demonstrate, repair and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods. Contractor responsibilities include the following:

1. Provide test specimens representative of proposed products and construction.
2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
5. When testing is complete, remove test specimens and test assemblies, do not reuse products on Project.
6. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

1.11 QUALITY CONTROL

A. Contractor Responsibilities: Tests and inspections are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

C. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

E. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

F. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspection equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents or as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payments.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
2. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Engineer.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

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SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Engineer's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Engineer limited to the Engineer's duties and responsibilities as stated in the Standard General Conditions of the Construction Contract. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if

bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents:

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents:

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.

25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CE - Conformite Europeenne; http://ec.europa.eu/growth/single-market/ce-marking/
51. CEA - Canadian Electricity Association; www.electricity.ca.
52. CEA - Consumer Electronics Association; www.ce.org.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.pbmdf.com.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csagroup.com.
65. CSA - CSA International; www.csa-international.org.
66. CSI - Construction Specifications Institute (The); www.csinet.org.
67. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.

69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHI - Door and Hardware Institute; www.dhi.org.
72. ECA - Electronic Components Association; (See ECIA).
73. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
74. ECIA - Electronic Components Industry Association; www.eciaonline.org.
75. EIA - Electronic Industries Alliance; (See TIA).
76. EIMA - EIFS Industry Members Association; www.eima.com.
77. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
78. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org .
79. ESTA - Entertainment Services and Technology Association; (See PLASA).
80. ETL - Intertek (See Intertek); www.intertek.com.
81. EVO - Efficiency Valuation Organization; www.evo-world.org.
82. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
83. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
84. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
85. FM Approvals - FM Approvals LLC; www.fmglobal.com.
86. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
87. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
88. FSA - Fluid Sealing Association; www.fluidsealing.com.
89. FSC - Forest Stewardship Council U.S.; www.fscus.org.
90. GA - Gypsum Association; www.gypsum.org.
91. GANA - Glass Association of North America; www.glasswebsite.com.
92. GS - Green Seal; www.greenseal.org.
93. HI - Hydraulic Institute; www.pumps.org.
94. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
95. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
96. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
97. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
98. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
99. IAS - International Accreditation Service; www.iasonline.org.
100. ICBO - International Conference of Building Officials; (See ICC).
101. ICC - International Code Council; www.iccsafe.org.
102. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
103. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
104. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
105. IEC - International Electrotechnical Commission; www.iec.ch.
106. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
107. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
108. IESNA - Illuminating Engineering Society of North America; (See IES).
109. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
110. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
111. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
112. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.

113. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
114. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
115. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
116. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
117. ISO - International Organization for Standardization; www.iso.org.
118. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
119. ITU - International Telecommunication Union; www.itu.int/home.
120. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
121. LMA - Laminating Materials Association; (See CPA).
122. LPI - Lightning Protection Institute; www.lightning.org.
123. MBMA - Metal Building Manufacturers Association; www.mbma.com.
124. MCA - Metal Construction Association; www.metalconstruction.org.
125. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
126. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
127. MHIA - Material Handling Industry of America; www.mhia.org.
128. MIA - Marble Institute of America; www.marble-institute.com.
129. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
130. MPI - Master Painters Institute; www.paintinfo.com.
131. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
132. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
133. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
134. NADCA - National Air Duct Cleaners Association; www.nadca.com.
135. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
136. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
137. NBI - New Buildings Institute; www.newbuildings.org.
138. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
139. NCMA - National Concrete Masonry Association; www.ncma.org.
140. NEBB - National Environmental Balancing Bureau; www.nebb.org.
141. NECA - National Electrical Contractors Association; www.necanet.org.
142. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
143. NEMA - National Electrical Manufacturers Association; www.nema.org.
144. NETA - InterNational Electrical Testing Association; www.netaworld.org.
145. NFHS - National Federation of State High School Associations; www.nfhs.org.
146. NFPA - National Fire Protection Association; www.nfpa.org.
147. NFPA - NFPA International; (See NFPA).
148. NFRC - National Fenestration Rating Council; www.nfrc.org.
149. NHLA - National Hardwood Lumber Association; www.nhla.com.
150. NLGA - National Lumber Grades Authority; www.nlga.org.
151. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
152. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
153. NRCA - National Roofing Contractors Association; www.nrca.net.
154. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
155. NSF - NSF International; www.nsf.org.
156. NSPE - National Society of Professional Engineers; www.nspe.org.

157. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
158. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
159. NWFA - National Wood Flooring Association; www.nwfa.org.
160. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
161. PDI - Plumbing & Drainage Institute; www.pdionline.org.
162. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
163. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
164. RFCI - Resilient Floor Covering Institute; www.rfci.com.
165. RIS - Redwood Inspection Service; www.redwoodinspection.com.
166. SAE - SAE International; www.sae.org.
167. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
168. SDI - Steel Deck Institute; www.sdi.org.
169. SDI - Steel Door Institute; www.steeldoor.org.
170. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
171. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
172. SIA - Security Industry Association; www.siaonline.org.
173. SJI - Steel Joist Institute; www.steeljoist.org.
174. SMA - Screen Manufacturers Association; www.smainfo.org.
175. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
176. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
177. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
178. SPIB - Southern Pine Inspection Bureau; www.spib.org.
179. SPRI - Single Ply Roofing Industry; www.spri.org.
180. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
181. SSINA - Specialty Steel Industry of North America; www.ssina.com.
182. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
183. STI - Steel Tank Institute; www.steeltank.com.
184. SWI - Steel Window Institute; www.steelwindows.com.
185. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
186. TCA - Tilt-Up Concrete Association; www.tilt-up.org..
187. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
188. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
189. TMS - The Masonry Society; www.masonrysociety.org.
190. TPI - Truss Plate Institute; www.tpinst.org.
191. TPI - Turfgrass Producers International; www.turfgrasssod.org.
192. TRI - Tile Roofing Institute; www.tileroofing.org.
193. UL - Underwriters Laboratories Inc.; http://www.ul.com.
194. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
195. USAV - USA Volleyball; www.usavolleyball.org.
196. USGBC - U.S. Green Building Council; www.usgbc.org.
197. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
198. WA - Wallcoverings Association; www.wallcoverings.org
199. WASTEC - Waste Equipment Technology Association; www.wastec.org.
200. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.

201. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
202. WDMA - Window & Door Manufacturers Association; www.wdma.com.
203. WI - Woodwork Institute; www.wicnet.org.
204. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
205. WWPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents:

1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
2. ICC - International Code Council; www.iccsafe.org.
3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents:

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. OSHA - Occupational Safety & Health Administration; www.osha.gov.
11. SD - Department of State; www.state.gov.
12. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
13. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
14. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
15. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
16. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents:

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.

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PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 014200

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services without cost, including, but not limited to, Engineer, Owner, testing agencies, and authorities having jurisdiction.

1.4 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within 30 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste-handling procedures.
5. Other dust-control measures.

F. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:

1. Methods used to meet the goals and requirements of the Owner.
2. Concrete cutting method(s) to be used.
3. Location of construction devices on the site.
4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
6. Indicate locations of sensitive equipment areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

1.5 QUALITY ASSURANCE

A. Temporary facilities shall comply with all applicable state and local ordinances, codes and regulations.

B. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

C. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its

use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS – NOT APPLICABLE

2.2 TEMPORARY FACILITIES, EQUIPMENT, AND SERVICES

A. Field Offices: No field office required for Engineer.

B. Contractor Field Office: Contractor shall provide Field Office that can be utilized by the Engineer on an as-needed basis.

1. Equipment:

a. Contractor shall provide the following equipment for the Engineer's use for the duration of the project. All equipment shall be new.

b. Digital camera:

1) Digital Camera: provide one new digital camera for the Engineer's use for the project duration. Camera shall be a major brand name (e.g., Minolta, Cannon, Olympic, Pentax, etc. – subject to the Engineer's approval) and shall have an automatic date function, 3 Mega pixel or greater, 3x optical zoom or better, and at least one GB of memory (on board or supplemental memory card). The camera shall come complete with carrying case, storage card, rechargeable batteries, battery charger, flash memory reader, USB cables and all necessary software. After completion of project the camera will become the property of the Owner.

c. Cellular telephone: smart phone with heavy duty protective case. Android operating system.

2. Services:

a. Provide the following services for the duration of the project. Services shall include all costs for installation, use, maintenance, and removal of all products, services and equipment billed by each provider for each service specified herein.

b. Internet Access:

1) Provide one air card for the Engineer's use for the duration of the project through Final Completion, with unlimited data plans.

c. Pay all costs for installation, maintenance, and removal of the internet service and instruments, including cellular phone service. The monthly cost of all calls made and received by the Engineer, including toll and long-distance calls, shall be paid for by the Contractor for the duration of the project.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from existing buildings.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 5 or greater at each return-air grille in system and remove at end of construction.
4. Retain "Air-Filtration Units" Paragraph below if negative-air-filtration units are required to maintain dust control for renovation work within occupied environments.

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where shown on the Drawings or where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work. Engineer's trailer shall be set up and ready for occupancy within 30 days of the Notice to Proceed.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use within 30 days of the Notice to Proceed and prior to Commencement of Work at the site. Do not remove until approved by Engineer or are replaced by authorized use of completed permanent facilities.

3.3 ENGINEER'S OFFICE – NOT APPLICBLE

3.4 CONTRACTOR'S FIELD OFFICE

A. Provide a temporary field office(s) for the Contractor's use for the duration of the project. An authorized representative of the Contractor shall be present at all times while the Work is in progress. Instructions received at the Contractors field office from the Engineer shall be considered delivered to the Contractor.

B. Locate field office(s) in accordance with approved shop drawings and as directed by the Owner.

C. Establish and occupy field office within 30 days of the Notice to Proceed, unless otherwise approved by the Engineer or Owner.

D. Contractor’s field office shall be large enough to fit a table and six (6) chairs.

3.5 TEMPORARY UTILITY INSTALLATION

A. General: Temporary utility services shall not connect to existing services unless approved by the Owner.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Contractor shall not connect to any Owner utilities for temporary utilities.

C. Water Service: Contractor to provide potable water service for use by their personnel and the Engineer.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel and Engineer. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

G. The Contractor shall furnish temporary light and power, including 220 Volt service for welding, complete with wiring, lamps and similar equipment as required to adequately light all work areas and with sufficient power capacity to meet the project needs. Make all necessary arrangements with the local electric company for temporary electric service and pay all expenses in connection therewith.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Telephone Service: Post a list of important telephone numbers in one common area for use by all personnel in Contractor Field Office.

a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Contractor's emergency after-hours telephone number.
e. Engineer's telephone number.
f. Owner's telephone number.
g. Principal subcontractors' field and home offices.

3.6 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
2. Maintain support facilities until Engineer schedules Final Completion inspection. Remove just before Final Completion.

B. Temporary Use of Roads and Paved Areas: Maintain roads and paved areas adequate for construction operations as well as to maintain Owner operations.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
2. Repair those portions of the pavement disturbed by the Work.

C. Traffic Control: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Use designated areas as shown on Drawings for parking areas to be used by construction personnel.

E. Storage and Staging: Use designated areas of Project site for storage and staging needs. If additional areas are required, Contractor to submit coordination drawing to Engineer and obtain written approval.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice from the Project Area as required to minimize accumulations.

G. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

J. Temporary Stairs: Provide temporary stairs where ladders are not adequate.

K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

3.7 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide, install and maintain signage directing occupants to temporary egress.

3.8 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Engineer.
    c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.9 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Clear snow and ice from all drives, walks and stairs in work area to maintain safe vehicle and pedestrian access to the site and facilities as directed by the Engineer.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Final Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Final Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Just prior to Final Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 011000 “Summary” for Contractor requirements related to Owner-furnished products.
2. Section 012500 "Substitution Procedures" for requests for substitutions.
3. Section 014200 "References" for applicable industry standards for products specified.
4. Section 017700 “Closeout Procedures” for submitting warranties.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycle contract materials are considered new products, unless indicated otherwise.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part2 “Comparable Products” Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

F. Substitution: Refer to Section 012500 “Substitution Procedures” for definition and limitations on substitutions.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Resolution of Compatibility Disputes between Multiple Contractors:

a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Engineer will determine which products shall be used.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

    a. Name of product and manufacturer.
    b. Model and serial number.
    c. Capacity.
    d. Speed.
    e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection for wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Engineer will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

    a. Submit additional documentation required by Engineer in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Engineer, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

    a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product that complies with requirements.

    a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer that complies with requirements.

   a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
   b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

   a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance the following requirements:

   1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
   2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
   3. Evidence that proposed product provides specified warranty.
   4. List of similar installations for completed projects, with project names and addresses and names and addresses of Engineers and owners, if requested.
   5. Samples, if requested.

B. Engineer's Action on Comparable Products Submittal: If necessary, Engineer will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."

   1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
   2. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by the Engineer of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

D. Submittal Requirements, Single-Step Process: When acceptable to Engineer, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Engineer of Contractor' request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 016000

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SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for coordination of Owner-furnished pre-procured products, and limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.

1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Engineer of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:

    a. Contractor's superintendent.
    b. Trade supervisor responsible for cutting and patching operations.
    c. Mechanical, electrical, roofing, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.

2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

B. Layout Conference: Conduct conference at Project site.

1. Prior to establishing layout of Work review layout and dimension requirements. Inform Engineer of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:

    a. Contractor's superintendent.
    b. Professional surveyor responsible for performing Project surveying and layout.

2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
3. Review requirements for including layouts on Shop Drawings and other submittals.
4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor. See Part 1.7 of this section.

B. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

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1.6 CLOSEOUT SUBMITTALS

A. Final Property Survey: Submit record survey following completion of the work showing the Work performed in accordance with Section 013300.

1.7 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in Illinois and who is experienced in providing land-surveying services of the kind indicated.

B. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."

C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements, whose structural function is not known, notify Engineer of locations and details of cutting and await directions from Engineer before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Plumbing piping systems.
    f. Mechanical systems piping and ducts.
    g. Control systems.
    h. Communication systems.
    i. Fire-detection and -alarm systems.
    j. Conveying systems.
    k. Electrical wiring systems.
    l. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Sprayed fire-resistive material.
    e. Equipment supports.

f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections and as shown on the Drawings.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Engineer for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection and points of crossing of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Engineer in accordance to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to existing conditions. If discrepancies are discovered, notify Engineer promptly.

B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.

7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements. Include pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

3.4 FIELD ENGINEERING

A. Identification: Identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

3.5 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

C. Sequence the Work and allow adequate clearances to accommodate movement of construction items onsite and placement in permanent locations.

D. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

E. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

F. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Engineer. Fit exposed connections together to form hairline joints.

G. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Engineer. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even

surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Repair Work previously completed and subsequently damaged during construction period Repair to like-new condition.

C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

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D. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

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SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:

1. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.

C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.

D. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS (NOT USED)

1.6 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, and waste reduction work plan. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials including the following:

1. Demolition Waste:

    a. Asphalt paving.
    b. Concrete.
    c. Concrete reinforcing steel.
    d. Brick.
    e. Concrete masonry units.
    f. Structural and miscellaneous steel.
    g. Rough hardware.
    h. Roofing.
    i. Insulation.
    j. Glazing.
    k. Metal studs.
    l. Equipment.
    m. Plumbing fixtures.
    n. Piping.
    o. Supports and hangers.
    p. Valves.
    q. Mechanical equipment.
    r. Refrigerants.
    s. Electrical conduit.
    t. Copper wiring.
    u. Lighting fixtures.
    v. Lamps.
    w. Ballasts.
    x. Electrical devices.

2. Construction Waste:

a. Masonry and CMU.
b. Lumber.
c. Wood sheet materials.
d. Wood trim.
e. Metals.
f. Roofing.
g. Insulation.
h. Piping.
i. Electrical conduit.
j. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

    1) Paper.
    2) Cardboard.
    3) Boxes.
    4) Plastic sheet and film.
    5) Polystyrene packaging.
    6) Wood crates.
    7) Wood pallets.
    8) Plastic pails.

k. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:

    1) Paper.
    2) Aluminum cans.
    3) Glass containers.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

3.3 DISPOSAL OF WASTE

A. General: Remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials onsite.

END OF SECTION 017419

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Requirements:

1. Section 012900 “Payment Procedures” for requirements for Applications for Payment for Substantial Completion and Final Completion.
2. Section 013233 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
3. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
4. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
5. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Engineer’s use prior to Engineer’s inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Engineer's signature for receipt of submittals.

5. Submit testing, adjusting, and balancing records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders (if requested by Owner or Engineer).
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 20 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.8 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:

1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.
5. Submit Final Completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first, listed by room or space number.
2. Organize items applying to each space by major element, including existing or new building, categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Engineer.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

    a. MS Excel Electronic File. Engineer will return annotated file.

1.10 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

g. Clean flooring, removing debris, dirt, and staining: clean according to manufacturer's recommendations.
h. Vacuum and mop concrete.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Wipe surfaces of mechanical and electrical equipment[, elevator equipment,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

o. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
p. Clean strainers.
q. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Section 019113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Engineer will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

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B. Format: Submit operation and maintenance manuals in accordance with Section 013300.

C. Initial Manual Submittal: Submit draft copy of each manual at least **30** days before commencing demonstration and training. Engineer will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least **15** days before commencing demonstration and training. Engineer will return copy with comments.

1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within **15** days of receipt of Engineer's comments and prior to commencing demonstration and training.

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required in accordance with Section 013300.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.

6. Name and contact information for Construction Manager.
7. Name and contact information for Engineer.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product,

list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

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PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 017823

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 012900 “Payment Procedures” for maintaining and exhibiting project record documents as a prerequisite for progress payments.
2. Section 017300 "Execution" for final property survey.
3. Section 017700 "Closeout Procedures" for general closeout procedures.
4. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints in accordance with Section 013300.

a. Initial Submittal:

1) Submit PDF electronic files of scanned record prints.
2) Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit PDF electronic files of marked-up record prints.

B. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an acceptable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Work Change Directive.
    k. Changes made following Engineer's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record print paper copies (Part A of this Section) with Engineer.

When authorized by the Engineer, prepare a full set of corrected record digital data files of the Contract Drawings, as follows:

1. Format: Annotated PDF electronic file with comment function enabled.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Engineer for resolution.
4. Engineer will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.

    a. See Section 013100 "Project Management and Coordination" for requirements related to use of Engineer's digital data files.
    b. Engineer will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Engineer.
    e. Name of Contractor.

1.5 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and Record Drawings where applicable.

C. Format: Submit Record Product Data as annotated PDF electronic file.

1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.6 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.7 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the contractor field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Engineer's reference during normal working hours. As a prerequisite for monthly progress payments, exhibit the updated record documents for review by Owner and Engineer for accuracy and completeness.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 017839

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SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For instructor and videographer.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit one copy within seven days after each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.

c. Name of Engineer.
d. Name of Contractor.
e. Date of video recording.

2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
3. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Engineer.

D. Coordinate demonstration and testing with Seller of pre-procured items.

1.7 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment (including pre-procured equipment), or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.

e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

1.8 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

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1.9 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Engineer will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Engineer, with at least 7 days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written or demonstration performance-based test. The selection of the type of test shall be agreed to with the Owner.

F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera meeting in accordance with the camera requirements outlined in Section.

1. Submit video recordings in accordance with Section 013300 and meeting the requirements of Section 013233 “Photographic Documentation.”
2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.

4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. Email address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while dubbing audio narration off-site after video recording is recorded as necessary. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 017900

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SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Owner's Project Requirements and Basis-of-Design Document are included by reference for information only.

1.2 SUMMARY

A. Section Includes:

1. General requirements for coordinating and scheduling commissioning activities.
2. Commissioning meetings.
3. Commissioning reports.
4. Use of commissioning process test equipment, instrumentation, and tools.
5. Construction checklists, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
6. Commissioning tests and commissioning test demonstration.
7. Adjusting, verifying, and documenting identified systems and assemblies.

B. Related Requirements:

1. Section 011000 "Summary" for Commissioning Authority responsibilities.
2. Section 013300 "Submittal Procedures" for submittal procedure requirements for commissioning process.
3. Section 017700 "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.
4. Section 017823 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal requirements.
5. Section 230800 "Commissioning of HVAC" for technical commissioning requirements for HVAC.
6. Section 260800 "Commissioning of Electrical Systems" for technical commissioning requirements for electrical systems.
7. Section 270800 "Commissioning of Communications" for technical commissioning requirements for communications systems.
8. Section 280800 "Commissioning of Electronic Safety and Security" for technical commissioning requirements for electronic safety and security systems.

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1.3 DEFINITIONS

A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

B. Basis-of-Design Document: A document prepared by Engineer that records concepts, calculations, decisions, and product selections used to comply with Owner's Project Requirements and to suit applicable regulatory requirements, standards, and guidelines.

C. Commissioning Authority: An entity engaged by Owner, and identified in Section 011000 "Summary," to evaluate Commissioning-Process Work.

D. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation of commissioning requirements.

E. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities. The scope of the commissioning process is defined in Section 011000 "Summary."

F. Construction-Phase Commissioning-Process Completion: The stage of completion and acceptance of commissioning process when resolution of deficient conditions and issues discovered during commissioning process and retesting until acceptable results are obtained has been accomplished. Owner will establish in writing the date construction-phase commissioning-process completion is achieved. See Section 017700 "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.

1. Commissioning process is complete when the Work specified of this Section and related Sections has been completed and accepted, including, but not limited to, the following:

    a. Completion of tests and acceptance of test results.
    b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
    c. Comply with requirements in Section 017900 "Demonstration and Training."
    d. Completion and acceptance of submittals and reports.

G. Owner's Project Requirements: A document that details the functional requirements of a project and the expectations of how it will be used and operated, including Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. This document is prepared either by the Owner or for the Owner by the Engineer or Commissioning Authority.

H. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Engineer-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.

I. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.

J. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

K. Sampling Procedures and Tables for Inspection by Attributes: As defined in ASQ Z1.4.

1.4 COMMISSIONING TEAM

A. Members Appointed by Contractor(s):

1. Commissioning Coordinator: A person or entity employed by Contractor to manage, schedule, and coordinate commissioning process.
2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the commissioning process.
3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the commissioning process.
4. Appointed team members shall have the authority to act on behalf of the entity they represent.

B. Members Appointed by Owner:

1. Commissioning Authority, plus consultants that Commissioning Authority may deem appropriate for a particular portion of the commissioning process.
2. Owner representative(s), facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that Owner may deem appropriate for a particular portion of the commissioning process.
3. Engineer, plus employees and consultants that Engineer may deem appropriate for a particular portion of the commissioning process.

1.5 INFORMATIONAL SUBMITTALS

A. Comply with requirements in Section 013300 "Submittal Procedures" for submittal procedure general requirements for commissioning process.

B. Commissioning Plan Information:

1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors performing the various commissioning requirements.
2. Schedule of commissioning activities, integrated with the Construction Schedule. Comply with requirements in Section 013200 "Construction Progress Documentation" for the Construction Schedule general requirements for commissioning process.
3. Contractor personnel and subcontractors participating in each test.
4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.

C. Commissioning schedule.

D. Two-week look-ahead schedules.

E. Commissioning Coordinator Letter of Authority:

1. Within 10 days after approval of Commissioning Coordinator qualifications, submit a letter of authority for Commissioning Coordinator, signed by a principal of Contractor's firm. Letter shall authorize Commissioning Coordinator to do the following:

    a. Make inspections required for commissioning process.
    b. Coordinate, schedule, and manage commissioning process of Contractor, subcontractors, and suppliers.
    c. Obtain documentation required for commissioning process from Contractor, subcontractors, and suppliers.
    d. Report issues, delayed resolution of issues, schedule conflicts, and lack of cooperation or expertise on the part of members of the commissioning team.

F. Commissioning Coordinator Qualification Data: For entity coordinating Contractor's commissioning activities to demonstrate their capabilities and experience.

1. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of 10 previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

G. List test instrumentation, equipment, and monitoring devices. Include the following information:

1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.
2. Brief description of intended use.
3. Calibration record showing the following:

    a. Calibration agency, including name and contact information.
    b. Last date of calibration.
    c. Range of values for which calibration is valid.
    d. Certification of accuracy.
    e. Certification for calibration equipment traceable to NIST.
    f. Due date of the next calibration.

H. Test Reports:

1. Pre-Startup Report: Prior to startup of equipment or a system, submit signed, completed construction checklists.
2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.
3. Commissioning Issue Reports: Daily, at the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.
4. Weekly Progress Report: Weekly, at the end of each week in which tests are conducted, submit a progress report.
5. Data Trend Logs: Submit data trend logs at the end of the trend log period.
6. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit printout of log of alarms that occurred since the last log was printed.

I. Construction Checklists:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

1.6 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction-Phase Commissioning Completion, include the following:

a. Pre-startup reports.
b. Approved test procedures.
c. Test data forms, completed and signed.
d. Progress reports.
e. Commissioning issue report log.
f. Commissioning issue reports showing resolution of issues.
g. Correspondence or other documents related to resolution of issues.
h. Other reports required by commissioning process.
i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction-Phase Commissioning Completion.
j. Report shall include commissioning work of Contractor.

B. Request for Certificate of Construction-Phase Commissioning Process Completion.

C. Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Commissioning Coordinator Qualifications:
1. Certification of commissioning-process expertise. The following certifications are acceptable. Owner reserves the right to accept or reject certifications as evidence of qualification.

a. Certified Commissioning Authority, by AABC Commissioning Group (ACG).
b. Commissioning-Process Management Professional, by American Society of Heating, Refrigerating and Air-Conditioning Engineers.
c. Certified Commissioning Professional, by Building Commissioning Association.
d. Accredited Commissioning-Process Authority Professional, by University of Wisconsin.
e. Accredited Commissioning-Process Manager, by University of Wisconsin.
f. Accredited Green Commissioning-Process Provider, by University of Wisconsin.

B. Calibration Agency Qualifications: Certified by The American Association for Laboratory Accreditation that the calibration agency complies with minimum requirements of ISO/IEC 17025.

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PART 2 - PRODUCTS

2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Test equipment and instrumentation required to perform the commissioning process shall remain the property of Contractor unless otherwise indicated.

B. Test equipment and instrumentation required to perform commissioning process shall comply with the following criteria:

1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.
2. Calibrated and certified.
    a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags shall be permanently affixed.
    b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.
3. Maintain test equipment and instrumentation.
4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.

1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

2.3 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Bind report in three-ring binders.
2. Label the front cover and spine of each binder with the report title, volume number, project name, Contractor's name, and date of report.
3. Record report on compact disk.

4. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include a table of contents and an index to each test.
2. Include major tabs for each Specification Section.
3. Include minor tabs for each test.
4. Within each minor tab, include the following:

a. Test specification.
b. Pre-startup reports.
c. Approved test procedures.
d. Test data forms, completed and signed.
e. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

PART 3 - EXECUTION

3.1 PREPARATION

A. Review preliminary construction checklists and preliminary test procedures and data forms.

3.2 CONSTRUCTION CHECKLISTS

A. Construction checklists cannot modify or conflict with the Contract Documents.

B. Create construction checklists based on actual systems and equipment to be included in Project.

C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment if applicable.

1. Service connection requirements, including configuration, size, location, and other pertinent characteristics.
2. Included optional features.
3. Delivery Receipt Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness, and lack of damage.
4. Installation Checks:

a. Location according to Drawings and approved Shop Drawings.
b. Configuration.
c. Compliance with manufacturers' written installation instructions.
d. Attachment to structure.

e. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.
f. Utility connections are of the correct characteristics, as applicable.
g. Correct labeling and identification.
h. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.

D. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, at minimum.

E. Performance Tests:

1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests.
2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.
3. Equipment and Assembly Performance Tests: Test and evaluate performance of equipment and assemblies under a full range of operating conditions and loads.
4. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.
5. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.

F. Deferred Construction Checklists: Obtain Owner approval of proposed deferral of construction checklists, including proposed schedule of completion of each deferred construction checklist, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. When approved, deferred construction checklists may be completed after date of Construction-Phase Commissioning Completion. Include the following in a request for Certificate of Construction-Phase Commissioning Process Completion:

1. Identify deferred construction checklists by number and title.
2. Provide a target schedule for completion of deferred construction checklists.
3. Written approval of proposed deferred construction checklists, including approved schedule of completion of each deferred construction checklist.

G. Delayed Construction Checklists: Obtain Owner approval of proposed delayed construction checklists, including proposed schedule of completion of each delayed construction checklist, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. When approved, delayed construction checklists may be completed after date of Construction-Phase Commissioning Completion. Include the following in a request for Certificate of Construction-Phase Commissioning Process Completion:

1. Identify delayed construction checklist by construction checklist number and title.
2. Provide a target schedule for completion of delayed construction checklists.
3. Written approval of proposed delayed construction checklists, including approved schedule of completion of each delayed construction checklist.

3.3 GENERAL EXECUTION REQUIREMENTS

A. Schedule and coordinate commissioning process with the Construction Schedule.

B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.

C. Report test data and commissioning issue resolutions.

D. Schedule personnel to participate in and perform Commissioning-Process Work.

E. Installing contractors' commissioning responsibilities include, but are not limited to, the following:

1. Operating the equipment and systems they install during tests.
2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

3.4 COMMISSIONING COORDINATOR RESPONSIBILITIES

A. Management and Coordination: Manage, schedule, and coordinate commissioning process, including, but not limited to, the following:

1. Coordinate with subcontractors on their commissioning responsibilities and activities.
2. Obtain, assemble, and submit commissioning documentation.
3. Attend/Conduct periodic on-site commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."
4. Develop and maintain the commissioning schedule. Integrate commissioning schedule into the Construction Schedule. Update Construction Schedule at specified intervals.
5. Review and comment on preliminary test procedures and data forms.
6. Report inconsistencies and issues in system operations.
7. Verify that tests have been completed and results comply with acceptance criteria, and that equipment and systems are ready before scheduling test demonstrations.
8. Direct and coordinate test demonstrations.
9. Coordinate witnessing of test demonstrations by Owner's witness.
10. Coordinate and manage training. Be present during training sessions to direct video recording, present training, and direct the training presentations of others. Comply with requirements in Section 017900 "Demonstration and Training."
11. Prepare and submit specified commissioning reports.
12. Track commissioning issues until resolution and retesting is successfully completed.
13. Retain original records of Commissioning-Process Work, organized as required for the commissioning report. Provide Owner's representative access to these records on request.
14. Assemble and submit commissioning report.

3.5 COMMISSIONING TESTING

A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Contractor's quality-control process.

B. Owner's witness will be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Owner's project manager will coordinate attendance by Owner's witness with Contractor's published Commissioning Schedule. Owner's witness will provide no labor or materials in the commissioning work. The only function of Owner's witness will be to observe and comment on the progress and results of commissioning process.

C. Construction Checklists:

1. Complete construction checklists as Work is completed.
2. Distribute construction checklists to installing contractors before they start work.
3. Installers:

    a. Verify installation using approved construction checklists as Work proceeds.

4. Provide Commissioning Authority access to construction checklists.

D. Installation Compliance Issues: Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists. Record installation compliance issues on the construction checklist at the time they are identified. Record corrective action and how future Work should be modified before signing off the construction checklist.

E. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if left uncorrected, adversely impact the ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.

F. Test Procedures and Test Data Forms:

1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.
2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.
3. Completed test data forms are the official records of the test results.
4. Commissioning Authority will provide to Contractor preliminary test procedures and test data forms for performance tests and commissioning tests after approval of Product Data, Shop Drawings, and preliminary operation and maintenance manual.
5. Review preliminary test procedures and test data forms, and provide comments within 14 days of receipt from Commissioning Authority. Review shall address the following:

    a. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.
    b. Applicability of the procedure to the specific software, equipment, and systems approved for installation.

6. After Contractor has reviewed and commented on the preliminary test procedures and test data forms, Commissioning Authority will revise and reissue the approved revised test procedures and test data forms marked "Approved for Testing."

7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.

G. Performance of Tests:

1. The sampling rate for tests is 100 percent. The sampling rate for test demonstrations is 100 percent unless otherwise indicated.
2. Perform and complete each step of the approved test procedures in the order listed.
3. Record data observed during performance of tests on approved data forms at the time of test performance and when the results are observed.
4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures and data forms according to the "Commissioning Compliance Issues" Paragraph in this Article.
5. On completion of a test, sign the completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.

H. Performance of Test Demonstration:

1. Perform test demonstrations on a sample of tests after test data submittals are approved. The sampling rate for test demonstrations shall be [**100**] <**Insert number**> percent unless otherwise indicated in the individual test specification.
2. Notify Owner's witness at least 7 days in advance of each test demonstration.
3. Perform and complete each step of the approved test procedures in the order listed.
4. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.
5. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration. On completion of a test demonstration, sign the completed data form and obtain signature of Owner's witness at the time of the test to authenticate the reported results.
6. Test demonstration data forms not signed by Contractor and Owner's witness at the time of the completion of the procedure will be rejected. Test demonstrations for which data forms are rejected shall be repeated and results shall be resubmitted.

    a. Exception for Failure of Owner's Witness to Attend: Failure of Owner's witness to be present for agreed-on schedule of test demonstration shall not delay Contractor. If Owner's witness fails to attend a scheduled test, Contractor shall proceed with the scheduled test. On completion, Contractor shall sign the data form for Contractor and for Owner's witness, and shall note the absence of Owner's witness at the scheduled time and place.

7. False load test requirements are specified in related sections.

    a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without Engineer's written approval.

I. Commissioning Compliance Issues:

1. Test results that are not within the range of acceptable results are commissioning compliance issues.
2. Track and report commissioning compliance issues until resolution and retesting are successfully completed.
3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Owner for billed costs for the participation in the repeated demonstration.
4. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:

    a. Complete a commissioning compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.
    b. Submit commissioning compliance issue report form within 24 hours of the test.
    c. Determine the cause of the failure.
    d. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.

5. Commissioning Compliance Issue Report: Provide a commissioning compliance issue report for each issue. Do not report multiple issues on the same commissioning compliance issue report.

    a. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning compliance issue report. (For example, if all return-air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning issue report. If a single commissioning issue report is used for multiple commissioning compliance issues, each device shall be identified in the report, and the total number of devices at issue shall be identified.
    b. Complete and submit Part 1 of the commissioning compliance issue report immediately when the condition is observed.
    c. Record the commissioning compliance issue report number and describe the deficient condition on the data form.
    d. Resolve commissioning compliance issues promptly. Complete and submit Part 2 of the commissioning compliance issue report when issues are resolved.

6. Diagnose and correct failed test demonstrations as follows:

    a. Perform diagnostic tests and activities required to determine the fundamental cause of issues observed.
    b. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.
    c. Record the results of each step of the diagnostic procedure.
    d. Record the conclusion of the diagnostic procedure on the fundamental cause of the issue.
    e. Determine and record corrective measures.
    f. Include diagnosis of fundamental cause of issues in commissioning compliance issue report.

7. Retest:

   a. Schedule and repeat the complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of Owner's witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Contractor's responsibility, compensate Owner for direct costs incurred as the result of repeated test demonstrations to achieve acceptable results.
   b. For each repeated test demonstration, submit a new test data form, marked "Retest."

8. Do not correct commissioning compliance issues during test demonstrations.

   a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than five minutes. If corrections are made under this exception, note the deficient conditions on the test data form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution has been completed.

3.6 COMMISSIONING MEETINGS

A. Schedule and conduct commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."

3.7 SEQUENCING

A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:

1. Construction Checklists:

   a. Material checks
   b. Installation checks.
   c. Startup, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which the startup depends.
   d. Performance Tests:

      1) Static tests, as appropriate.
      2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.
      3) Equipment and assembly performance tests.
      4) System performance tests.
      5) Intersystem performance tests.

2. Commissioning tests.

B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.

C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Engineer if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.

D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

3.8 SCHEDULING

A. Commence commissioning process as early in the construction period as possible.

B. Commissioning Schedule: Integrate commissioning activities into Construction Schedule. See Section 013200 "Construction Progress Documentation."

1. Include detailed commissioning activities in monthly updated Construction Schedule and short-interval schedule submittals.
2. Schedule the start date and duration for the following commissioning activities:

    a. Submittals.
    b. Preliminary operation and maintenance manual submittals.
    c. Installation checks.
    d. Startup, where required.
    e. Performance tests.
    f. Performance test demonstrations.
    g. Commissioning tests.
    h. Commissioning test demonstrations.

3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.
4. Determine milestones and prerequisites for commissioning process. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short-interval schedule submittals.

C. Two-Week Look-Ahead Commissioning Schedule:

1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning process.
2. Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.
3. Use two-week look-ahead schedules to notify and coordinate participation of Owner's witnesses.

D. Owner's Witness Coordination:

1. Coordinate Owner's witness participation via Engineer.
2. Notify Engineer of commissioning schedule changes at least 7 days in advance for activities requiring the participation of Owner's witness.

3.9 COMMISSIONING REPORTS

A. Test Reports:

1. Pre-startup reports include observations of the conditions of installation, organized into the following sections:

   a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.
   b. Preinstallation Physical Condition Checks: Observe physical condition of equipment prior to installation. Note conditions including, but not limited to, physical damage, corrosion, water damage, or other contamination or dirt.
   c. Preinstallation Component Verification Checks: Verify components supplied with the equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.
   d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and the corrective actions for each. Verify that issues noted have been corrected.
   e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to Owner completion of equipment model verification, preinstallation physical condition checks, preinstallation component verification checks, and completion of corrective actions for installation compliance issues.

2. Test data reports include the following:

   a. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.
   b. Data and observations, including, but not limited to, data trend logs, recorded during the tests.
   c. Signatures of individuals performing and witnessing tests.
   d. Data trend logs accumulated overnight from the previous day of testing.

3. Commissioning Compliance Issue Reports: Report as commissioning compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Use sequentially numbered facsimiles of commissioning compliance issue report form included in this Section, or other form approved by Owner. Distribute commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:

a. Commissioning compliance issue report number. Assign unique, sequential numbers to individual commissioning compliance issue reports when they are created, to be used for tracking.
b. Action distribution list.
c. Report date.
d. Test number and description.
e. Equipment identification and location.
f. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.
g. Diagnostic procedure or plan to determine the cause (include in initial submittal)
h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).
i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.
j. When issues have been resolved, update and resubmit the commissioning issue report forms by completing Part 2. Identify resolution taken and the dates and initials of the persons making the entries.
k. Schedule for retesting.

4. Weekly progress reports include information for tests conducted since the preceding report and the following:

a. Completed data forms.
b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.
c. Activities scheduled but not conducted per schedule.
d. Commissioning compliance issue report log.
e. Schedule changes for remaining Commissioning-Process Work, if any.

5. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.

a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.
b. Attach to the data form printed trend log data collected during the test or test demonstration.
c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.

6. System Alarm Logs: Record and print out a log of alarms that occurred since the last log was printed. Evaluate alarms to determine if the previous day's work resulted in any conditions that are not considered "normal operation."

a. Conditions that are not considered "normal operation" shall be reported on a commissioning issue report attached to the alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in

manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

3.10 CERTIFICATE OF CONSTRUCTION-PHASE COMMISSIONING PROCESS COMPLETION

A. When Contractor considers that construction-phase commissioning process, or a portion thereof which Owner agrees to accept separately, is complete, Contractor shall prepare and submit to Owner and Commissioning Authority through Engineer a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to compete commissioning process.

B. On receipt of Contractor's list, Commissioning Authority will make an inspection to determine whether the construction-phase commissioning process or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether included on Contractor's list, which is not sufficiently complete as defined in "Construction-Phase Commissioning Process Completion" Paragraph in the "Definitions" Article, Contractor shall, before issuance of the Certificate of Construction-Phase Commissioning Process Completion, complete or correct such items on notification by Commissioning Authority. In such case, Contractor shall then submit a request for another inspection by Commissioning Authority to determine construction-phase commissioning process completion.

C. Contractor shall promptly correct deficient conditions and issues discovered during commissioning process. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Engineer's and Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.

D. When construction-phase commissioning process or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction-Phase Commissioning Process Completion that shall establish the date of completion of construction-phase commissioning process. Certificate of Construction-Phase Commissioning Process Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION 019113

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Work Change Directive No.

Date of Issuance:	Effective Date:
Owner:	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer:	Engineer's Project No.:
Project:	Contract Name:

Contractor is directed to proceed promptly with the following change(s):

Description:

Attachments: *[List documents supporting change]*

Purpose for Work Change Directive:

Directive to proceed promptly with the Work described herein, prior to agreeing to changes on Contract Price and Contract Time, is issued due to: *[check one or both of the following]*

☐ Non-agreement on pricing of proposed change.

☐ Necessity to proceed for schedule or other Project reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price $ [increase] [decrease].

Contract Time days [increase] [decrease].

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price

☐ Cost of the Work ☐ Other

RECOMMENDED:	AUTHORIZED BY:	RECEIVED:
By:	By:	By:
Engineer (Authorized Signature)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Title:	Title:	Title:
Date:	Date:	Date:

Approved by Funding Agency (if applicable)

By: Date:

Title:

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EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Change Order No. _____

Date of Issuance:	Effective Date:
Owner:	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer:	Engineer's Project No.:
Project:	Contract Name:

The Contract is modified as follows upon execution of this Change Order:

Description:

Attachments: *[List documents supporting change]*

CHANGE IN CONTRACT PRICE	**CHANGE IN CONTRACT TIMES** *[note changes in Milestones if applicable]*
Original Contract Price: $_____	Original Contract Times: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: $_____	[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: Substantial Completion: _____ Ready for Final Payment: _____ days
Contract Price prior to this Change Order: $_____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] of this Change Order: $_____	[Increase] [Decrease] of this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
Contract Price incorporating this Change Order: $_____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for Final Payment: _____ days or dates

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____	By: _____	By: _____
Engineer (if required)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Title: _____	Title _____	Title _____
Date: _____	Date _____	Date _____

Approved by Funding Agency (if applicable)

By: _____ Date:

Title: _____

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EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Field Order No. _____

Date of Issuance:	Effective Date:
Owner:	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer:	Engineer's Project No.:
Project:	Contract Name:

Contractor is hereby directed to promptly execute this Field Order, issued in accordance with General Conditions Paragraph 11.01, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference: _____ Specification(s) _____ Drawing(s) / Detail(s)

Description:

Attachments:

ISSUED:	RECEIVED:
By: _____ Engineer (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____
Date: _____	Date: _____

Copy to: Owner

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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 017300 "Execution" for cutting and patching procedures.
2. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove Hazardous Materials: Isolate and remove hazardous materials from existing construction and properly dispose as required by existing regulations.

C. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

D. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

E. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

F. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure or equipment.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.

B. Selective Demolition Work Plan: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's and other tenants' on-site operations are uninterrupted.
2. Detailed plan for demolition of each item, structure, or utility to be removed per drawings and specifications.

3. Interruption of utility services. Indicate how long utility services will be interrupted.
4. Coordination for shutoff, capping, and continuation of utility services.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

C. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

D. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

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1.8 FIELD CONDITIONS

A. Owner will occupy portions of building in the vicinity of the selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected, isolated, and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building or structure to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Survey of Existing Conditions: Record existing conditions by use of measured drawings preconstruction photographs or video and templates.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain or as directed by the Owner or Engineer, and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. In no case shall any existing back-up generator equipment be removed, dismounted, or disabled until Contractor has fully commissioned and tested the new generator system, and the Owner has provided written authorization to Contractor to explicitly decommission the existing generator.

2. Owner will arrange to shut off indicated services/systems when requested by Contractor. Contractor to coordinate with Owner regarding proper procedures (paperwork, notices, etc.) to shut off requested equipment.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material. Remove any fuel or other materials prior to capping.
    b. Piping to be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place. Remove any fuel or other materials prior to capping.
    c. Equipment to be Removed: Disconnect and cap services and remove equipment. Remove any fuel or other materials prior to capping.
    d. Equipment to be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational. Remove any fuel or other materials prior to capping.
    e. Equipment to be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner. Remove any fuel or other materials prior to capping.
    f. Ducts to be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
2. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
3. Maintain fire watch during and for at least one (1) hour after flame-cutting operations.
4. Maintain adequate ventilation when using cutting torches.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Concrete, Asphalt and Other Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction. and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete manufacturer.
    d. Concrete Subcontractor.
    e. Special concrete finish Subcontractor.

2. Review special inspection and testing, and Contractor's inspecting agency procedures for field quality control; concrete finishes and finishing; curing procedures, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness; and concrete protection.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each formulation of concrete proposed for use, submit constituent quantities per cubic yard (cubic meter), water cementitious ratio, air content, concrete slump, type and manufacturer of cement and type and manufacturer of fly ash or ground granulated blast furnace slag. For each concrete mixture, submit alternate design mixtures when characteristics of materials change, source of cement or aggregate change or test results do not meet specification requirements, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, spacing, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Reference bars to be the same identification marks shown on the bar bending details.

D. Construction Joint Layout: As shown on the Drawings.

E. Welding certificates.

F. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

G. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
2. Mill Test Reports:

    a. Cementitious materials.
    b. Steel Reinforcing.
    c. Reinforcing Splicing Devices.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer independent testing agency responsible for concrete design mixtures.

B. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

C. Field quality-control reports.

D. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment:

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated:

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Provide reinforcement free from mill scale, rust, mud, dirt, grease, oil, ice, or other foreign matter that will reduce or destroy bond. Deliver, store, and handle steel reinforcement to prevent bending and damage. Store reinforcement off the ground, protect from moisture, and keep out of standing water, and free from rust, mud, dirt, grease, oil, ice, or other contaminants and deleterious films that will reduce or destroy bond.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.10 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures:

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301.
2. ACI 117.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints:

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1 or better.
b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
c. Structural 1, B-B or better; mill oiled and edge sealed.
d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

3. Overlaid Finnish birch plywood.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal:

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to below grade walls.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Reinforcing bars to be welded or field bent: Low-Alloy-Steel Reinforcing Bars, ASTM A 706/A 706M, deformed.

2.4 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

B. Tie wires for reinforcement: 16 gauge or heavier black annealed wire to tie uncoated reinforcing. Use zinc coated wire to tie galvanized reinforcing. Use epoxy coated wire to tie epoxy coated reinforcing.

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2.5 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type II.
2. Fly Ash: ASTM C 618, Class F.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C 595/C 595M, Type IS, portland blast-furnace slag cement.
5. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source:

1. Maximum Coarse-Aggregate Size: ASTM C33 Size Number 57 nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride:

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Accelerating Admixture: ASTM C 494/C 494M, Type C.
4. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
5. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
6. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
7. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
8. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Water: ASTM C 94/C 94M and potable.

2.6 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.7 RELATED MATERIALS

2.8 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations:

1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than4000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.9 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301:

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Slag Cement: 50 percent.
4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions:

1. Use water-reducing admixture in concrete, for placement and workability.
2. High-range water-reducing admixture in concrete, may be used, for placement and workability.
3. Plasticizing admixture in concrete, may be used, for placement and workability.
4. Water-reducing and -retarding admixture, may be used, when required by high temperatures, low humidity, or other adverse placement conditions.
5. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold-weather placement requirements.

6. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

D. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Slabs-on-Grade: Normal-weight concrete:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 520 lb/cu. yd..
4. Slump Limit: 5 inches, plus or minus 1 inch.
5. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information:

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer:

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

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PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.

D. Construct forms tight to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical:

1. Install reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, ice, snow and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded:

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained:

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.4 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement:

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose mill scale, rust, mud, dirt, grease, oil, ice, and other foreign materials that reduce or destroy the bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars:

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, only where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing, 1.3 times the development length, or 8 inches, whichever is greater. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Splicing:

1. Tension Members: Avoid splicing of reinforcing steel in concrete elements indicated as "tension members." However, if splices are required for constructability, splices in the reinforcement subject to direct tension shall be butted and joined with complete penetration welds to develop, in tension, at least 125 percent of the specified yield strength of the bar. Offset splices in adjacent bars the distance of a Class B splice or 30 inches, whichever is greater.
2. Lap splices in welded wire fabric in accordance with the requirements of ACI 318 but not less than 12 inches. Tie the spliced fabrics together with wire ties spaced not more than 24 inches on center and lace with wire of the same diameter as the welded wire fabric. Offset splices in adjacent widths to prevent continuous splices.
3. Reinforcing Splicing Devices: Use only where indicated. Offset splices in adjacent bars by at least 30 bar diameters. Use only for special splice and dowel conditions indicated or approved by the Engineer.
4. After installation of mechanical reinforcing steel coupling system, on reinforcement, repair coating damage in accordance with the applicable ASTM standard. Coat all parts of mechanical connectors used on coated bars including steel splice sleeves, bolts and/or nuts with the same material used for the repair of damaged coating.
5. If not indicated on Drawings, locate reinforcement splices at point of minimum stress.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer:

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation:

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid “cold” joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete:

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.6 FINISHING FORMED SURFACES

A. Finish concrete surfaces according to ACI 301 and ACI 318.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities:

1. Apply to concrete surfaces to receive a rubbed finish.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings:

1. Apply a trowel finish to surfaces exposed to view.

C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated:

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

3.8 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Pads:

1. Coordinate sizes and locations of concrete pads with actual equipment provided.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Install reinforcing dowels; to connect concrete pad to concrete floor. Unless otherwise indicated.
4. For supported equipment, install anchor bolts that extend through concrete pad and anchor into structural concrete substrate.
5. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
6. Cast anchor-bolt insert into pads. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape:

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall

within three hours after initial application. Maintain continuity of coating and repair damage during curing period:

a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning:

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit sawcut at the perimeter of the area to a depth of 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template:

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.11 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Notify the Owner when the reinforcing is complete and ready for inspection, at least six working hours prior to the proposed concrete placement. Do not cover reinforcing steel with concrete until the installation of the reinforcement, including the size, spacing and position of the reinforcement has been inspected by the Owner’s inspection agency and the Owner’s inspection agency release to proceed with the concreting has been obtained. Keep forms open until the Owner’s inspection agency has completed inspection of the reinforcement.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements by the Owner’s testing agency:

1. Testing Frequency: One composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

2. Testing Frequency: One composite sample for each 100-cu. yd. or fraction thereof of each concrete mixture placed each day:

    a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests will be performed when concrete consistency appears to change.
4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete;one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M:

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days:

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
11. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.

13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

3.12 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

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SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Formed wall sheet metal fabrications.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review requirements for insurance and certificates if applicable.
3. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following

1. Elastomeric sealant.
2. Sheet metal flashing

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.

3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
8. Include details of special conditions.
9. Include details of connections to adjoining work.
10. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

C. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

B. Special warranty.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period:

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.

1. Source Limitations: Obtain sheet from single source from single manufacturer.
2. Nonpatinated, Exposed Finish: Mill.
3. Nonpatinated, Exposed, Lacquered Finish: Finish designations for copper alloys comply with system defined in NAAMM/NOMMA 500:

a. Brushed Satin (Lacquered): M32-06x (Mechanical Finish: directionally textured, medium satin; with clear organic coating); coating of "Incralac," waterborne, methyl methacrylate copolymer lacquer with UV inhibitor, applied by air spray in two coats in accordance with manufacturer's written instructions to total thickness of 1 mil.

b. Mirror Polished (Lacquered): M22-06x (Mechanical Finish: buffed, specular; with clear organic coating); coating of "Incralac," waterborne, air-drying, methyl methacrylate copolymer lacquer with UV inhibitor, applied by air spray in two coats in accordance with manufacturer's written instructions to total thickness of 1 mil.

4. Prepatinated Copper-Sheet Finish: Dark brown, prepatinated in accordance with ASTM B882.

C. Stainless Steel Sheet: ASTM A240/A240M, Type 316, dead soft, fully annealed; with smooth, flat surface:

1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).

a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
b. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches:

1) Run grain of directional finishes with long dimension of each piece.
2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

D. Zinc-Tin Alloy-Coated Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 temper; coated on both sides with zinc-tin alloy (50 percent zinc, 50 percent tin):

1. Source Limitations: Obtain sheet from single source from single manufacturer.

E. Zinc Sheet: Zinc, 99 percent pure, alloyed with 0.08 to 1.00 percent copper, 0.06 to 0.20 percent titanium, and up to 0.015 percent aluminum; with manufacturer's standard factory-applied, flexible, protective back coating:

1. Source Limitations: Obtain sheet from single source from single manufacturer.
2. Finish: Preweathered black.

F. Copper-Clad Stainless Steel Sheet: ASTM B506, annealed Temper O61:

1. Source Limitations: Obtain sheet from single source from single manufacturer.
2. Nonpatinated, Exposed Finish: Mill.
3. Nonpatinated, Exposed, Lacquered Finish: Finish designations for copper alloys comply with system defined in NAAMM/NOMMA 500.

a. Brushed Satin (Lacquered): M32-06x (Mechanical Finish: directionally textured, medium satin; with clear organic coating); coating of "Incralac," [**waterborne,**] [**solvent-borne,**] methyl methacrylate copolymer lacquer with UV inhibitor, applied by air spray in two coats per manufacturer's written instructions to total thickness of 1 mil.

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2.3 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

    a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
    c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Copper, Zinc-Tin Alloy-Coated Copper, and Copper-Clad Stainless Steel Sheet: Copper, hardware bronze or passivated Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
4. Fasteners for Zinc Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.

C. Solder:

1. For Copper and Copper-Clad Stainless Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead with maximum lead content of 0.2 percent.
2. For Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
3. For Zinc-Tin Alloy-Coated Copper: ASTM B32, 100 percent tin, with maximum lead content of 0.2 percent, as recommended by sheet metal manufacturer.
4. For Zinc: ASTM B32, 40 percent tin and 60 percent lead with low antimony, with maximum lead content of 0.2 percent, as recommended by zinc manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

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2.4 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim:

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
3. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.

H. Do not use graphite pencils to mark metal surfaces.

2.5 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch- high, end dams. Fabricate from the following materials, to best match existing construction:

1. Copper: 16 oz./sq. ft..
2. Stainless Steel: 0.0156 inch thick.
3. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft.
4. Zinc: 0.032 inch thick.
5. Copper-Clad Stainless Steel: 0.016 inch thick.

2.6 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials, to best match existing construction:

1. Copper: 16 oz./sq. ft..
2. Stainless Steel: 0.0188 inch thick.
3. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft..
4. Galvanized Steel: 0.028 inch thick.
5. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
6. Copper-Clad Stainless Steel: 0.018 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work:

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings:

1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
8. Do not field cut sheet metal flashing and trim by torch.
9. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard:

1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim:

1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction:

1. Use sealant-filled joints unless otherwise indicated.

a. Embed hooked flanges of joint members not less than 1 inch into sealant.
b. Form joints to completely conceal sealant.
c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
d. Adjust setting proportionately for installation at higher ambient temperatures:

1) Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter:

1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not solder metallic-coated steel and aluminum sheet.
3. Do not pretin zinc-tin alloy-coated copper.
4. Do not use torches for soldering.
5. Heat surfaces to receive solder, and flow solder into joint:

a. Fill joint completely.
b. Completely remove flux and spatter from exposed surfaces.

6. Stainless Steel Soldering:

a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
b. Promptly remove acid-flux residue from metal after tinning and soldering.
c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

7. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.
8. Copper-Clad Stainless Steel Soldering: Tin edges of uncoated sheets, using solder for copper-clad stainless steel.

H. Rivets: Rivet joints in [**uncoated aluminum**] [**zinc**] where necessary for strength.

3.3 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.4 INSTALLATION OF MISCELLANEOUS FLASHING

A. Equipment Support Flashing:

1. Coordinate installation of equipment support flashing with installation of equipment.
2. Weld or seal flashing with elastomeric sealant to equipment support member.

3.5 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.7 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Engineer.

END OF SECTION 076200

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SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetration firestopping systems for the following applications:

a. Penetrations in fire-resistance-rated walls.
b. Penetrations in horizontal assemblies.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency:

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

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1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

C. Notify testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency:

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."
3) FM Approval in its "Approval Guide."

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2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. 3M Fire Protection Products
    b. A/D Fire Protection Systems
    c. Construction Solutions
    d. Grabber Construction Products
    e. Hilti, Inc
    f. HOLDRITe
    g. NUCO, Inc
    h. Passive Fire Protection Partners
    i. RectorSeal Firestop
    j. Specified Technologies, Inc
    k. STC Sound Control
    l. Tremoc, Inc

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg:

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

2. Fire-resistance-rated walls include fire-barrier walls.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg:

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
4. Horizontal assemblies include floors and floor/ceiling assemblies.

D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

E. Manufactured Piping Penetration Firestopping System: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg:

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
4. Sleeve: Molded-PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A48/A48M, gray-iron, hubless-pattern wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated:

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.
5. Temporary forming materials.
6. Masking Tape: Type recommended by firestopping manufacturer or width required by project conditions.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be

permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings:

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes:

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for sealing joints through fire-rated construction.
2. Section 076200 "Sheet Metal Flashing and Trim" for sealing joints in exterior wall penetrations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

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1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency:

1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period:

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Engineer from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Corporation.
b. Pecora Corporation.
c. Sika Corporation; Joint Sealants.
d. Tremco Incorporated.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Corporation.
b. Pecora Corporation.

c. Sika Corporation; Joint Sealants.
d. Tremco Incorporated.

2.4 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Alcot Plastics Ltd.
b. BASF Corporation.
c. Construction Foam Products; a division of Nomaco, Inc.
d. Pecora Corporation.
e. Sika Corporation; Joint Sealants.
f. Tremco Incorporated.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage

or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

   a. Construction joints in cast-in-place concrete.
   b. Joints between plant-precast architectural concrete units.
   c. Control and expansion joints in unit masonry.
   d. Joints in dimension stone cladding.
   e. Joints in glass unit masonry assemblies.
   f. Joints in exterior insulation and finish systems.
   g. Joints between metal panels.
   h. Joints between different materials listed above.
   i. Perimeter joints between materials listed above and frames of doors windows and louvers.
   j. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Engineer from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Tile control and expansion joints.
   c. Vertical joints on exposed surfaces of unit masonry concrete walls and partitions.
   d. Joints on underside of plant-precast structural concrete beams and planks.
   e. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Engineer from manufacturer's full range of colors.

END OF SECTION 079200

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SECTION 088813 - FIRE-RATED GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-resistive framing.
2. Fire-resistance-rated glazing.

1.3 DEFINITIONS

A. Fire-Protection-Rated Glazing: Glazing in rated doors and openings up to 45 minutes, limited in size, and not capable of blocking radiant heat.

B. Fire-Resistance-Rated Glazing: Glazing that prevents spread of fire and smoke and radiant heat; used in rated wall and door applications 60 minutes and above without size limitations.

C. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

D. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product; 12 inches square.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and glass testing agency.

B. Product Certificates: For each type of glass and glazing product.

C. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the NGA's Certified Glass Installer Program.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during remainder of construction period.

1.10 WARRANTY

A. Manufacturer's Special Warranty for Tempered Glazing Units with Clear Intumescent Interlayer: Manufacturer agrees to replace units that deteriorate within specified warranty period. Deterioration of tempered glazing units with clear intumenscent interlayer is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning glass contrary to manufacturer's written instructions. Evidence of failure is air bubbles within units, or obstruction of vision by contamination or deterioration of intumescent interlayer.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: For each glass type, obtain from single source from single manufacturer.

B. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. NGA Publications: "Glazing Manual."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.4 GLASS PRODUCTS

A. Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Ultraclear Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear), with visible light transmission not less than 91 percent.

C. Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) unless otherwise indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer unless fire-protection or fire-resistance rating is based on another product.
2. Interlayer Thickness: Provide thickness as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.5 FIRE-RESISTANCE-RATED GLAZING

A. Fire-Resistance-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing in accordance with ASTM E119 or UL 263.

B. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that glazing is approved for use in walls, and fire-resistance rating in minutes.

C. Fire-Resistance-Rated Framing and Doors: Fire-resistance-rated glazing with 60-, 90-, and 120-minute ratings requires framing and doors from glass supplier, tested as an assembly complying with ASTM E119 or UL 263.

D. Fire-Resistance-Rated Tempered Glazing Units with Clear Intumescent Interlayer: Glazing units made from two or more lites of uncoated, fully tempered, clear float glass; with a perimeter edge seal enclosing a cavity filled with optically clear, intumescent polymer; complying with 16 CFR 1201, Category II.

1. Basis-of-Design Product: Subject to compliance with requirements, provide SAFTI FIRST Fire Rated Glazing Solutions; SuperLite II-XL120 IGU.

2.6 FIRE-RESISTANCE-RATED WINDOW/WALL GLAZING ASSEMBLY

A. Fire-Resistance-Rated Wall Glazing Assembly: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for 2-hour fire-resistance wall assembly rating, based on testing in accordance with ASTM E119. Comply with 16 CFR 1201, Category II.

1. Basis-of-Design Product: Subject to compliance with requirements, provide SAFTI FIRST Fire Rated Glazing Solutions; GPX Architectural Series Fire Resistive Wall.

2.7 GLAZING ACCESSORIES

A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.

B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. GE Construction Sealants; Momentive Performance Materials Inc.
b. The Dow Chemical Company.

c. Tremco Incorporated.

2. Colors of Exposed Glazing Sealants: To match existing adjacent exterior sealants.

C. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

D. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

C. Perimeter Insulation for Fire-Resistance-Rated Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate fire side and protected side. Label or mark units as needed so that fire side and protected side are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.

B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch- minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

I. Set glass lites with proper orientation so that coatings face fire side or protected side as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop, so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial washaway from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 FIRE-RESISTANCE-RATED GLAZING SCHEDULE

A. Glass Type FRGL-1: 120-minute fire-resistance-rated glazing complying with ASTM E119 or UL 263 in a tested assembly of glass and framing with 450 deg F temperature-rise limitation; fire-resistance-rated tempered glazing units with clear intumescent interlayer.

END OF SECTION 088813

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SECTION 099010 - SHOP PRIMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes shop primers not included in other sections.

B. Related Requirements:

1. Division 09 for field applied painting.
2. Other specifications that reference this specification for primers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include written statement, or published product data, that the confirms that the shop primer materials are compatible with the finish and field coatings.

B. Samples: For each exposed product.

1.4 QUALITY ASSURANCE

A. Compatibility of Coating Systems: Shop priming with primers that are guaranteed, in writing, by the manufacturer to be compatible with field applied and other coatings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Submerged Surfaces: Shop primer for ferrous metals which will be in contact with water being treated, either submerged or which are subject to splash action or which are specified to be considered submerged service:

1. Shop Prime Coat: (Zinc Micaceous Iron Oxide Polyurethane Aromatic Shop Primer):

a. TNEMEC: Series 94-H2O Hydro-Zinc.
b. Carboline: Carboguard 635VOC.

c. Sherwin-Williams Company (The): Corothane I Zinc Primer 1K Mio-Zinc.
d. PPG Industries - Protective and Marine Coatings: Amerlock 2 Epoxy.
e. Or equal.

B. Non-Submerged Surfaces: Shop primer for ferrous metals which will not be in contact with water being treated, not submerged and not subject to splash action:

1. Shop Prime Coat: (Zinc Micaceous Iron Oxide Polyurethane Aromatic Shop Primer):

a. TNEMEC: Series 1 Omnithane.
b. Carboline: Carboguard 61.
c. Sherwin-Williams Company (The): Corothane I Zinc Primer 1K Mio-Zinc.
d. PPG Industries - Protective and Marine Coatings: Durathane MCZ 97-679 Series or Amercoat 68HS.
e. Or equal.

C. Submerged Surfaces:

1. Shop Prime Coat for Ductile Iron Pipe: (Epoxy, Polyamidoamine Shop Primer):

a. TNEMEC: Series 94-H2O Hydro-Zinc.
b. Carboline: Carboguard 635VOC.
c. Sherwin-Williams Company (The): Macropoxy 5500.
d. PPG Industries - Protective and Marine Coatings: Amerlock 2 Epoxy.
e. Or equal.

2. Shop Prime Coat for Ferrous Metal Surfaces: (Zinc Micaceous Iron Oxide Polyurethane Aromatic Shop Primer):

a. TNEMEC: Series 94-H2O Hydro-Zinc.
b. Carboline: Carboguard 635VOC.
c. Sherwin-Williams Company (The): Corothane I Zinc Primer 1K Mio-Zinc.
d. PPG Industries - Protective and Marine Coatings: Amerlock 2 Epoxy.
e. Or equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface preparation: Comply with the manufacturer's written requirements for the substrate to be primed.

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3.2 PROTECTION

A. Non-Primed Surfaces: Apply a heavy shop coat of grease or other suitable rust-resistant coating to gears, bearings surfaces and other similar surfaces which are not to be field painted:

1. Maintain this coating to prevent corrosion until final acceptance testing of equipment.

END OF SECTION 099010

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SECTION 099100 – PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following substrates:

1. Concrete.
2. Concrete masonry units (CMUs).
3. Steel and iron.
4. Galvanized metal.
5. Gypsum board.
6. Cotton or canvas insulation covering.

B. Section includes painting all exposed structural and miscellaneous steel; chemical tanks and systems; mechanical and electrical equipment; sluice gates, operators and posts; conveying systems, pipe, fittings and valves; electrical conduit and appurtenances; new or patched CMU or gypsum board walls; all as specified in the attached painting schedules and all other work obviously required to be painted unless otherwise specified. Minor items not mentioned in the schedule of work shall be included in the work of this Section where they come within the general intent of this Section as stated herein.

C. Provide vinyl film letters and numbers for markings as specified.

D. Paint items noted in other Specification Sections as having factory finish and other factory finished items are obviously not field painted.

E. Paint all factory finish painted items replaced, repaired or damaged during construction.

F. The various Sections are responsible, as stated in each, for preparation and field touch-up of abrasions, welds and damaged primed areas of primed or galvanized components after erection.

G. The following items will not be painted:

1. Concrete except where existing painted concrete is disturbed by new work.
2. Stainless steel louvers, doors and frames.
3. Finish hardware.
4. Non-ferrous metals and stainless steel, unless specifically noted otherwise.
5. Factory pre-finished architectural components.
6. Packing glands and other adjustable parts and name plates of mechanical equipment.

7. Parts of buildings not exposed to sight, unless specifically noted otherwise.
8. Maintenance equipment
9. Plumbing fixtures.
10. Mechanical, HVAC, Plumbing and Electrical equipment which has been finished painted in the factory as specified in Divisions [22, 23, 26, 41, 42, 43, 44, 46 and 48].

H. Related Requirements:

1. Valve identification is included in Divisions 11, 22, 23, 41, 42, 43, 44, 46 and 48.
2. Shop priming of equipment and piping (except copper piping) are specified in Section 099010 "Shop Priming" and included in the respective Section with the item to be primed.
3. Section 055000 "Metal Fabrications" for shop priming metal fabrications.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat:

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

A. Shop Primers, specified in Section 099010 "Shop Priming," and other Sections are required to be certified by the manufacturer of the field applied painting manufacturer to be compatible with the materials specified in this section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F:

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products by one of the following:

1. Tnemec, Inc. (TN)
2. The Sherwin Williams Company (SW)
3. PPG Architectural Finishes, Inc. (PPG)
4. PPG Architectural Finishes, Inc. Ameron (AME)
5. Or equal

2.2 MATERIALS

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. Provide products of same manufacturer for each coat in a coating system.

B. Use paint materials without adulteration and mixed, thinned and applied in strict accordance with manufacturer's directions for the applicable materials and surface.

C. Colors: To match existing adjacent construction or to match owner’s existing paint color-coding system.

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2.3 COLOR CODING FOR PIPES AND EQUIPMENT

A. The color code establishes, defines and assigns a definite color for each process system. Paint all elements which are an integral part of the system, that is originating from the equipment and/or supplying the equipment, between and up to but not including the fixed flanges nor the flexible conduit connections on the equipment. Paint valves and fittings in the color of the main body of the pipe.

B. All pipes and equipment shall be painted with final coat color selected by the Engineer and shall be treated as an integral part of the Contract.

C. All hanger saddles and pipe support floor stands shall be painted the same color and with the same paint as the pipe it supports. Hanger rods and hanger rod connections to building structure shall be painted to match the color of the wall or ceiling to which it is attached.

2.4 LETTERING OF TITLES

A. Indicate the name of the materials in each pipeline and alongside this an arrow indicating the direction of flow of fluids on each pipe system. Locate the titles shall not more than 26 feet apart and directly adjacent to each side of any wall the pipeline breaches, adjacent to each side of the valve regulator, flowcheck, strainer cleanout and all pieces of equipment.

B. Identify titles by the identity of the contents with complete name at least once in each space through which it passes and thereafter by generally recognized abbreviations, letters or numerals as approved. Place identification title locations in general they shall be placed where the view is unobstructed and on the two lower quarters of pipe or covering where they are overhead. Title to be clearly visible from operating positions and adjacent to all control valves.

C. Die cut numbers and letters from 3.5 mil vinyl film and pre-space them on carrier tape. Protect adhesive and finish surface with one piece removable liners. Use white or black to provide high contrast to the substrate color.

D. Letter size shall be as indicated in the following table:

OUTSIDE DIAMETER OF PIPE OR COVERING	SIZE OF LEGEND LETTERS
3/4-in to 1-1/4-in	1/2-in
1-1/2-in to 2-in	3/4-in
2-1/2-in to 6-in	1-1/2-in
8-in to 10-in	2-1/2-in
Over 10-in	3-in

E. Use Type B ASI/2 by ASI Sign Systems; Architectural Graphics Inc. or equal. Provide Optima Bold, upper case letter type. Use Grid 2 spacing. Match arrow to letter type and size. Follow the instructions of the manufacturer in respect to storage, surface preparation and applications of letters.

2.5 TITLES FOR EQUIPMENT

A. Provide titles consisting of vinyl film as specified above on all equipment using 1-in high Optima Bold upper case, Grid 2 spacing. Use white or black to provide high contrast to the substrate color. Use titles shown on mechanical drawings for bidding purposes. Mount titles at eye level on machines or at the upper most broad vertical surface of low equipment. Where more than one piece of the equipment item to be titled exists, number the items consecutively as indicated on the mechanical drawings or as directed by the Engineer; for example, Pump No. 1, Pump No. 2, etc. Titles shall be composed in more than one line if required and justified on the left-hand side.

2.6 TESTING EQUIPMENT

A. Furnish wet and dry film thickness gauges, electronic moisture meter and all other equipment required by the Engineer for inspection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

    a. Concrete: 12 percent.
    b. Masonry (Clay and CMU): 12 percent.
    c. Wood: 15 percent.
    d. Gypsum Board: 12 percent.

B. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected:

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting:

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants:

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

J. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

K. Mock-up: Provide a sample area of the finished work prepared in strict accordance with this Section to demonstrate the quality and workmanship of painting. When paint colors are required to match existing installed colors, provide as many paint manufacturer's warehouse mixed colors until accepted by the Engineer.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness:

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

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3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Engineer, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 PAINTING SCHEDULE

A. Dry Film Thickness (DFT) for each paint product is not part of paint schedule. Submit both the Wet Film Thickness (WFT) and DFT for each product as part of submittal process. Apply paint and coating products to comply with manufacturer's DFT thickness and application recommendations in the approved submittal.

3.7 The following types of paints by Tnemec Co. (TN), The Sherwin Williams Company (SW), PPG Protective & Marine Coatings, (PPG), and Ameron International (AME) have been used as a basis for the paint schedule; use one of these paints or equal:

A. Epoxy:

1. TN:Hi-build Epoxoline II, Series N69.
2. SW: Macropoxy 646, B58 Series.
3. PPG: Pitt-Guard 97-145 Series Epoxy Mastic.
4. AME: Amerlock 2/400 Series Epoxy.

B. Waterborne Cementitious Acrylic: Result in pinhole free surface.

1. TN:Envirofil, Series 130-6602.
2. SW: Cement-Plex 875, B42 Series.
3. PPG: Cementitious Waterproofing Block Filler 95-217 Series.
4. AME: Amerlock 400 BF Epoxy Block Filler.

C. High-Build Acrylic Polyurethane Enamel:

1. TN:Endura-Shield - semi-gloss, Series V73.
2. SW: Acrolon 218 HS, B65 Series.
3. PPG: Pitthane HB Semigloss Urethane 95-8800 Series.
4. AME: Amercoat 450HSG Polyurethane.

D. High Heat Silicone Aluminum (to 600 degrees F):

1. TN:No product.
2. SW: Heat-Flex Hi-Temp 1000 Aluminum, B59-820 Series.
3. PPG: Speedhide 6-220 Series Silicone Aluminum Coating.
4. AME: Amercoat 878 Silicone Aluminum Coating.

E. Tie Coat, Low VOC, Epoxy:

1. TN:FC Typoxy, Series V27.
2. SW: Macropoxy 646, B58 Series.
3. PPG: Pitt-Guard Epoxy Mastic 95-245 Series.
4. AME: Amercoat 385 Multi-Purpose Epoxy.

F. Acrylic Latex Emulsion, Eggshell Finish:

1. TN:Tneme-Cryl, Series 6.
2. SW: DTM Primer/Finish, B66 Series.
3. PPG: Pitt-Tech Plus 90-1110 Series Satin DTM Acrylic.
4. AME: Amercoat 220 Waterborne Acrylic.

G. Vinyl Acrylic Surface Sealer:

1. TN:PVA Sealer, Series 51.
2. SW: Prep-Rite 200 Primer, B28 Series.
3. PPG: Speedhide 6-2 Vinyl Acrylic Drywall Primer.
4. AME: Amercoat 148 Acrylic Primer.

H. The following surfaces shall have the types of paint scheduled below applied at the dry film thickness (DFT) in mils per coat as recommended by manufacturer:

1. Exterior non- submerged ferrous metals (except first coat-hollow metal-pressed metal work):

   a. Mechanically abrade existing surfaces to comply with SSPC SP 7 "Brush Off Blast Cleaning of Ferrous Metals."

   b. First Coat: On properly prepared unprimed metal or for touch-up:
      1) TN: Hi-build Epoxoline II, Series N69.
      2) SW: Macropoxy 646, B58 Series.
      3) PPG: Pitt-Guard 97-145 Series Epoxy Mastic.
      4) AME: Amerlock 2/400 Series Epoxy.

   c. Second Coat:

      1) TN: Hi-build Epoxoline II, Series N69.
      2) SW: Macropoxy 646, B58 Series.
      3) PPG: Pitt-Guard 97-145 Series Epoxy Mastic.
      4) AME: Amerlock 2/400 Series Epoxy.

   d. Third Coat:

1) TN: Endura-Shield - semi-gloss, Series V73.
2) SW: Acrolon 218 HS, B65 Series.
3) PPG: Pitthane HB Semigloss Urethane 95-8800 Series.
4) AME: Amercoat 450HSG Polyurethane.

2. Interior non-submerged concrete scheduled for painting:

a. First and Second Coats:

1) TN: Hi-build Epoxoline II, Series N69.
2) SW: Macropoxy 646, B58 Series.
3) PPG: Pitt-Guard 97-145 Series Epoxy Mastic.
4) AME: Amerlock 2/400 Series Epoxy.

3. Interior concrete masonry units:

a. First Coat: Result in pinhole free surface.

1) TN: No. 130-6602.
2) SW: Cement-Plex 875, B42 Series.
3) PPG: Cementitious Waterproofing Block Filler 95-217 Series.
4) AME: Amerlock 400 BF Epoxy Block Filler.

b. Second and Third Coats:

1) TN: Hi-build Epoxoline II, Series N69.
2) SW: Macropoxy 646, B58 Series.
3) PPG: Pitt-Guard 97-145 Series Epoxy Mastic.
4) AME: Amerlock 2/400 Series Epoxy.

4. Interior non-submerged ferrous metals (except first coat of previously painted metal work), on properly prepared unprimed metal or for touch-up:

a. First Coat:

1) TN: Hi-build Epoxoline II, Series N69.
2) SW: Macropoxy 646, B58 Series.
3) PPG: Pitt-Guard 97-145 Series Epoxy Mastic.
4) AME: Amerlock 2/400 Series Epoxy.

b. Second and Third Coats:

1) TN: Hi-build Epoxoline II, Series N69.
2) SW: Macropoxy 646, B58 Series.
3) PPG: Pitt-Guard 97-145 Series Epoxy Mastic.
4) PPG: Amerlock 2/400 Series Epoxy.

5. Plastic piping and, where scheduled to be painted, plastic components:

a. First and Second Coats:

1) TN: Hi-build Epoxoline II, Series N69.
2) SW: Macropoxy 646, B58 Series.
3) PPG: Pitt-Guard 97-145 Series Epoxy Mastic.
4) AME: Amerlock 2/400 Series Epoxy.

6. Previously painted existing concrete/CMU scheduled for painting:

   a. First Coat:

      1) TN: H.B. Tneme-Tufcoat, Series 113.
      2) SW: Pro Industrial Waterbased Catalyzed Epoxy, B73-300.
      3) PPG: Aquapon WB Epoxy 98-1 Series.
      4) AME: Amercoat 335 WB Epoxy.

   b. Second Coat:

      1) TN: Enviro-Glaze, Series 297.
      2) SW: Pro Industrial Waterbased Catalyzed Epoxy, B73-300.
      3) PPG: Aquapon WB Epoxy 98-1 Series.
      4) AME: Amercoat 335 WB Epoxy.

7. Existing precast concrete plank ceilings scheduled to be painted.

   a. First and Second Coats:

      1) TN: H.B. Tneme-Tufcoat, Series 113.
      2) SW: Pro Industrial Waterbased Catalyzed Epoxy, B73-300.
      3) PPG: Aquapon WB Epoxy 98-1 Series.
      4) AME: Amercoat 335 WB Epoxy.

8. Pipe insulation: (Plastic or metal sheathed insulation-paint as scheduled for appropriate substrate):

   a. First Coat:

      1) TN: Vinyl-Acrylic Sealer, No. 51-792.
      2) SW: Prep-Rite 200, B28 Series.
      3) PPG: Speedhide 6-2 Vinyl Acrylic Drywall Primer.
      4) AME: Amercoat 148 Acrylic Primer.

   b. Second and Third Coats:

      1) TN: Hi-build Epoxoline II, Series N69.
      2) SW: Macropoxy 646, B58 Series.
      3) PPG: Pitt-Guard 97-145 Series Epoxy Mastic.
      4) AME: Amerlock 2/400 Series Epoxy.

9. Previously Painted Metal Surfaces:

a. First coat on substrates prepared as approved and replacing first coat of above-specified systems. Complete painting with remainder of specified system for each type of substrate.

b. First Coat:

1) TN: FC Typoxy, Series V27.
2) SW: Macropoxy 646, B58 Series.
3) PPG: Pitt-Guard 97-145 Series Epoxy Mastic.
4) AME: Amerlock 2/400 Series Epoxy.

10. Exterior galvanized steel surfaces:

a. Mechanically abrade existing surfaces to comply with SSPC SP 16 "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-ferrous Metals."

b. First Coat:

1) TN: FC Typoxy, Series V27.
2) SW: Macropoxy 646, B58 Series.
3) PPG: Pitt-Guard Epoxy Mastic 95-245 Series.
4) AME: Amercoat 385 Multi-Purpose Epoxy.

c. Second Coat:

1) TN: Endura-Shield - semi-gloss, Series V73.
2) SW: Acrolon 218 HS.
3) PPG: Pitthane HB Semigloss Urethane 95-8800 Series.
4) AME: Amercoat 450HSG Polyurethane.

11. Gypsum Work:

a. First Coat:

1) TN: PVA Sealer No. 51-792.
2) SW: PrepRite 200 Primer, B28 Series.
3) PPG: Speedhide 6-2 Vinyl Acrylic Drywall Primer.
4) AME: Amercoat 148 Acrylic Primer.

b. Second and Third Coats:

1) TN: Tneme-Cryl Series 6.
2) SW: DTM Primer/Finish, B66 Series.
3) PPG: Pitt-tech Plus 90-1110 Series Satin DTM Acrylic.
4) AME: Amercoat 220 Waterborne Acrylic.

END OF SECTION 099100

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SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

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2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Rotor: Random-wound, squirrel cage.

E. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

F. Temperature Rise: Match insulation rating.

G. Insulation: Class F.

H. Code Letter Designation:

1. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

I. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

C. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 230513

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SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Duct labels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. Brimar Industries, Inc.
c. Carlton Industries, LP.

2. Material and Thickness: Brass, 0.032-inch; stainless steel, 0.025-inch; aluminum, 0.032-inch; or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
3. Letter Color: Black or White.

4. Background Color: White or Black.
5. Letter and Background Color shall be different.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 DUCT LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: Black or White.

D. Background Color: Black or White.

E. Letter and Background color shall be different.

F. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

G. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

H. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

I. Fasteners: Stainless-steel rivets or self-tapping screws.

J. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

K. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean duct and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 DUCT LABEL INSTALLATION

A. Install plastic-laminated or self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
1. Green: For exhaust-air ducts.

B. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 25 feet in each space where ducts are exposed.

END OF SECTION 230553

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SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:
    a. Constant-volume air systems.
2. Testing, Adjusting, and Balancing Equipment:
    a. Motors.
3. Duct leakage tests.
4. Control system verification.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. TAB: Testing, adjusting, and balancing.

E. TABB: Testing, Adjusting, and Balancing Bureau.

F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

G. TDH: Total dynamic head.

1.4 PREINSTALLATION MEETINGS

A. TAB Conference: If requested by the Owner, conduct a TAB conference at Project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 3 days' advance notice of scheduled meeting time and location.

1. Minimum Agenda Items:

    a. The Contract Documents examination report.
    b. The TAB plan.
    c. Needs for coordination and cooperation of trades and subcontractors.
    d. Proposed procedures for documentation and communication flow.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 60 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 60 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. System Readiness Checklists: Within 60 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.

E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.

F. Certified TAB reports.

G. Sample report forms.

H. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.6 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC, NEBB, or TABB.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB as a TAB technician.

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.7 FIELD CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

I. Examine operating safety interlocks and controls on HVAC equipment.

J. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
b. Duct systems are complete with terminals installed.
c. Volume, smoke, and fire dampers are open and functional.
d. Clean filters are installed.
e. Fans are operating, free of vibration, and rotating in correct direction.
f. Automatic temperature-control systems are operational.
g. Ceilings are installed.
h. Windows and doors are installed.
i. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing", and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation."

C. Mark equipment and balancing devices, including damper-control positions, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts" and Section 233116 “Nonmetal Ducts.”

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures as follows:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.
    d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from Engineer or Owner for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.6 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

3.7 DUCT LEAKAGE TESTS

A. Witness the duct pressure testing performed by Installer.

B. Verify that proper test methods are used and that leakage rates are within specified tolerances.

C. Report deficiencies observed.

3.8 CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Verify temperature control system is operating within the design limitations.
2. Confirm that the sequences of operation are in compliance with Contract Documents.
3. Verify that controllers are calibrated and function as intended.
4. Verify that controller set points are as indicated.
5. Verify the operation of lockout or interlock systems.
6. Verify the operation of damper actuators.
7. Verify that controlled devices are properly installed and connected to correct controller.
8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.9 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.10 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Engineer's name and address.
6. Contractor's name and address.
7. Report date.
8. Signature of TAB supervisor who certifies the report.
9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
10. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer's name, type, size, and fittings.
13. Notes to explain why certain final data in the body of reports vary from indicated values.
14. Test conditions for fan performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Fan drive settings including settings and percentage of maximum pitch diameter.
    e. Settings for supply-air, static-pressure controller.
    f. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Terminal units.
4. Balancing stations.
5. Position of balancing devices.

E. Chlorine Scrubber Test Reports: Coordinate with the chlorine scrubber manufacturer during testing and include the following:

1. Unit Data:

   a. Unit identification.
   b. Location.
   c. Make and type.
   d. Model number and unit size.
   e. Manufacturer's serial number.
   f. Unit arrangement and class.
   g. Discharge arrangement.
   h. Sheave make, size in inches, and bore.
   i. Center-to-center dimensions of sheave and amount of adjustments in inches.
   j. Number, make, and size of belts.

2. Motor Data:

   a. Motor make, and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches, and bore.
   f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

   a. Total airflow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan rpm.
   d. Discharge static pressure in inches wg.
   e. Exhaust-air damper position.

F. Fan Test Reports: For exhaust fans, include the following:

1. Fan Data:

   a. System identification.
   b. Location.
   c. Make and type.
   d. Model number and size.
   e. Manufacturer's serial number.

f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

G. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

H. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.

i. Effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Air velocity in fpm.
c. Preliminary airflow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final airflow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

I. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.11 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer may conduct the inspection in the presence of Engineer or Owner.

B. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. If TAB work fails, proceed as follows:

1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
3. If the second verification also fails, Owner or Engineer may contact AABC Headquarters regarding the AABC National Performance Guaranty.

D. Prepare test and inspection reports.

END OF SECTION 230593

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SECTION 230933 – ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. ATC system for controlling of HVAC systems.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories."
2. Section 260519 “Low-Voltage Electrical Power Conductors and Cables.”
3. Section 260523 "Control-Voltage Electrical Power Cables."
4. Section 260533 "Raceways and Boxes for Electrical Systems."
5. Section 260553 "Identification for Electrical Systems.
6. Section 463126.15 “Emergency Gas Treatment Systems.”

C. Furnish and install a complete electric automatic temperature control system as manufactured by Johnson Controls, Schneider Electric, or Automated Logic Corporation.

D. Control system shall consist of all thermostats, temperature switches, flow switches, automatic dampers, damper operators, control panels, electric relays, and other accessory equipment along with a complete system of electrical wiring to fill the intent of the specification and sequences of operation on the Drawings and provide for a complete and operable system.

1.3 DEFINITIONS

A. Analog: A continuously varying signal value, such as current, flow, pressure, or temperature.

B. Binary: Two-state signal where a high signal level represents ON" or "OPEN" condition and a low signal level represents "OFF" or "CLOSED" condition. "Digital" is sometimes used interchangeably with "Binary" to indicate a two-state signal.

C. I/O: System through which information is received and transmitted. I/O refers to analog input (AI), binary input (BI), analog output (AO) and binary output (BO). Analog signals are continuous and represent control influences such as flow, level, moisture, pressure, and temperature. Binary signals convert electronic signals to digital pulses (values) and generally represent two-position operating and alarm status. "Digital," (DI and (DO), is sometimes used interchangeably with "Binary," (BI) and (BO), respectively.

D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product include the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation, operation and maintenance instructions including factors effecting performance.
5. Bill of materials of indicating quantity, manufacturer, and extended model number for each unique product.

    a. Enclosures.
    b. Electrical power devices.
    c. Instruments.
    d. Control dampers and actuators.

6. When manufacturer's product datasheets apply to a product series rather than a specific product model, clearly indicate and highlight only applicable information.
7. Each submitted piece of product literature shall clearly cross reference specification and drawings that submittal is to cover.

B. Shop Drawings:

1. General Requirements:

    a. Include cover drawing with Project name, location, Owner, Engineer, Contractor and issue date with each Shop Drawings submission.
    b. Include a drawing index sheet listing each drawing number and title that matches information in each title block.
    c. Drawings Size: 11”x17”.

2. Include plans, elevations, sections, and mounting details where applicable.
3. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

4. Schematic drawings for each controlled HVAC system indicating the following:

    a. I/O points labeled with point names shown. Indicate instrument range, normal operating set points, and alarm set points. Indicate fail position of each damper.

b. I/O listed in table format showing point name, type of device, manufacturer, model number, and cross-reference to product data sheet number.
c. A graphic showing location of control I/O in proper relationship to HVAC system.
d. Wiring diagram with each I/O point having a unique identification and indicating labels for all wiring terminals.
e. Unique identification of each I/O that shall be consistently used between different drawings showing same point.
f. Elementary wiring diagrams of controls for HVAC equipment motor circuits including interlocks, switches, relays and interface to ATC controllers.
g. Narrative sequence of operation.
h. Graphic sequence of operation, showing all inputs and output logical blocks.

5. Control panel drawings indicating the following:

a. Panel dimensions, materials, size, and location of field cable, raceways, and tubing connections.
b. Interior subpanel layout, drawn to scale and showing all internal components, cabling and wiring raceways, nameplates and allocated spare space.
c. Front, rear, and side elevations and nameplate legend.
d. Unique drawing for each panel.

6. ATC system electrical power riser diagram indicating the following:

a. Each point of connection to field power with requirements (volts/phase/hertz/amperes/connection type) listed for each.
b. Each control power supply including, as applicable, transformers, power-line conditioners, transient voltage suppression and high filter noise units, DC power supplies, and UPS units with unique identification for each.
c. Each product requiring power with requirements (volts/phase/hertz/amperes/connection type) listed for each.
d. Power wiring type and size, race type, and size for each.

1.5 DELEGATED-DESIGN SUBMITTAL

A. For ATC system products and installation indicated as being delegated.

1. Supporting documentation showing ATC system design complies with performance requirements indicated, including calculations and other documentation necessary to prove compliance.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For ATC system to include in emergency, operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Project Record Drawings of as-built versions of submittal Shop Drawings provided in electronic PDF format.

PART 2 - PRODUCTS

2.1 ATC SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ATC system to satisfy requirements indicated.

B. Surface-Burning Characteristics: Products installed in ducts and equipment shall comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Environmental Conditions for Instruments and Actuators:

1. Instruments and actuators shall operate without performance degradation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified and encountered for installed location.

a. If instruments and actuators alone cannot comply with requirement, install instruments and actuators in protective enclosures that are isolated and protected from conditions impacting performance. Enclosure shall be internally insulated, electrically heated and ventilated as required by instrument and application.

2. Instruments, actuators and accessories shall be protected with enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Instruments and actuators not available with integral enclosures complying with requirements indicated shall be housed in protective secondary enclosures. Installed location shall dictate the following NEMA 250 enclosure requirements:

a. Outdoors: Type 4X, 316 stainless steel.
b. Chemical storage rooms: Type 4X, non-metallic (FRP).

D. Continuity of Operation after Electric Power Interruption:

1. Equipment and associated factory-installed controls, field-installed controls, electrical equipment, and power supply connected to building normal and backup power systems shall automatically return equipment and associated controls to operating state occurring immediately before loss of normal power, without need for manual intervention by

operator when power is restored either through backup power source or through normal power if restored before backup power is brought online.

2.3 ENCLOSURES

A. General Enclosure Requirements:

1. House each controller and associated control accessories in an enclosure. Enclosure shall serve as central tie-in point for control devices such as switches, transmitters, transducers, power supplies and transformers.
2. Do not house more than one controller in a single enclosure.
3. Include enclosure door with key locking mechanism. Key locks alike for all enclosures and include one pair of keys per enclosure.
4. Equip doors of enclosures housing controllers and components with analog or digital displays with windows to allow visual observation of displays without opening enclosure door.
5. Individual wall-mounted single-door enclosures shall not exceed 36 inches wide and 60 inches high.
6. Freestanding enclosures shall not exceed 48 inches wide and 72 inches high.
7. Include wall-mounted enclosures with brackets suitable for mounting enclosures to wall or freestanding support stand as indicated.
8. Supply each enclosure with a complete set of as-built schematics, tubing, and wiring diagrams and product literature located in a pocket on inside of door. For enclosures with windows, include pocket on bottom of enclosure.

B. Internal Arrangement:

1. Internal layout of enclosure shall group and protect electric and electronic components associated with a controller, but not an integral part of controller.
2. Arrange layout to group similar products together.
3. Include a barrier between line-voltage and low-voltage electrical and electronic products.
4. Factory or shop install products, tubing, cabling and wiring complying with requirements and standards indicated.
5. Terminate field cable and wire using heavy-duty terminal blocks.
6. Include spare terminals, equal to not less than 10 percent of used terminals.
7. Include spade lugs for stranded cable and wire.
8. Install a maximum of two wires on each side of a terminal.
9. Include enclosure field power supply with a toggle-type switch located at entrance inside enclosure to disconnect power.
10. Include enclosure with a line-voltage nominal 20-A GFCI duplex receptacle for service and testing tools. Wire receptacle on hot side of enclosure disconnect switch and include with a 5-A circuit breaker.
11. Provide at least two Form C relays to monitor alarms to SCADA.
12. Mount products within enclosure on removable internal panel(s).
13. Include products mounted in enclosures with engraved, laminated phenolic nameplates (black letters on a white background). The nameplates shall have at least 1/4-inch-high lettering.
14. Route tubing cable and wire located inside enclosure within a raceway with a continuous removable cover.

15. Label each end of cable, wire and tubing in enclosure following an approved identification system that extends from field I/O connection and all intermediate connections throughout length to controller connection.
16. Size enclosure internal panel to include at least 25 percent spare area on face of panel.

C. Environmental Requirements:

1. Evaluate temperature and humidity requirements of each product to be installed within each enclosure.
2. Calculate enclosure internal operating temperature considering heat dissipation of all products installed within enclosure and ambient effects (solar, conduction and wind) on enclosure.
3. Where required by application, include temperature-controlled electrical heat to maintain inside of enclosure above minimum operating temperature of product with most stringent requirement.
4. Where required by application, include temperature-controlled ventilation fans with filtered louver(s) to maintain inside of enclosure below maximum operating temperature of product with most stringent requirement.
5. Include temperature-controlled cooling within the enclosure for applications where ventilation fans cannot maintain inside temperature of enclosure below maximum operating temperature of product with most stringent requirement.
6. Where required by application, include humidity-controlled electric dehumidifier or cooling to maintain inside of enclosure below maximum relative humidity of product with most stringent requirement and to prevent surface condensation within enclosure.

2.4 Wall-Mounted, NEMA 250, Type 4X SS:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Hoffman; a brand of nVent.

2. Enclosure shall be NRTL listed according to UL 508A.
3. Seam and joints are continuously welded and ground smooth.
4. Externally formed body flange around perimeter of enclosure face for continuous perimeter seamless gasket door seal.
5. Construct enclosure of Type 304 or Type 316L stainless steel, not less than the following:

    a. Size Less Than 24 Inches: 0.053 inch thick.
    b. Size 24 Inches and Larger: 0.067 inch thick.

6. Outside body and door of enclosure with brushed No. 4 finish.
7. Corner-formed door, full size of enclosure face, supported using multiple concealed hinges with easily removable hinge pins.

    a. Sizes through 24 InchesTall: Two hinges.
    b. Sizes between 24 Inchesthrough 48 InchesTall: Three hinges.
    c. Sizes Larger 48 InchesTall: Four hinges.

8. Corner-formed door, full size of enclosure face, supported using continuous piano hinge full length of door.
9. Doors fitted with three-point (top, middle, and bottom) latch system with single, heavy-duty, liquid-tight Type 316 stainless-steel handle with integral locking mechanism.
10. Removable internal panel shall be 0.093-inch solid steel with a white polyester powder coating that is electrostatically applied and then baked to bond to substrate.
11. Internal panel mounting studs and hardware, grounding hardware, and sealing washers.
12. Install corrosion-resistant polyester vent drain in a stainless-steel sleeve at the bottom of enclosure.
13. Include enclosure with stainless-steel mounting brackets

2.5 ELECTRONIC DAMPER ACTUATORS

A. Electronic actuators, less than 600 in.-lb. of rated torque, must have ISO 9001 quality certification and be UL listed under standard 873, CSA C22.2 No. 24 and have CE certification. Electronic actuators used on valves must be designed to directly couple and mount to a stem, shaft or ISO style-mounting pad. Actuator mounting clamps must be a V-bolt with a toothed V-clamp creating a cold weld, positive grip effect. Single point, bolt or single screw actuator type fastening techniques or direct-coupled actuators requiring field assembly of the universal clamp is not acceptable.

B. Actuators must be two position and have visual position indicators and must operate in sequence with other devices if required.

C. Actuator must have an operating range of minus 22 to 122 degrees F.

D. Actuators must be capable of operating on 24 VAC/VDC or 120 VAC. Power consumption must not exceed 10 VA for AC, including 120 VAC actuators and 8 watts per actuator for applications.

E. Actuators must have electronic overload protection or digital rotation sensing circuitry to prevent actuator damage throughout the entire rotation. End switches to deactivate the actuator at the end of rotation or magnetic clutches are not acceptable.

1. For power-failure/safety applications, an internal mechanical spring return mechanism must be built into the actuator housing. Spring return actuators must be capable of CW or CCW mounting orientation. Spring return models >60 in.-lb. will be capable of mounting on shafts up to 1.05-in. diameter. Spring return actuators with more than 60 in.-lb. of torque must have a manual override metal crank. Upon loss of control signal, a proportional actuator must fail open or closed based on the minimum control signal. Upon loss of power, a non-spring return actuator must maintain the last position.

2. Actuators must be capable of being mechanically and electrically paralleled to increase torque if required. Dampers requiring greater torque or higher close off may be assembled with multiple low torque actuators. Dual mounted actuators using additional anti-rotation strap mechanical linkages or special factory wiring to function are not acceptable. Actuators in a tandem pair must be "off the shelf" standard actuators ready for field wiring.

3. Damper actuators must not produce more than 62 dbA when furnished with a mechanical fail-safe spring. Non-spring return actuators must conform to a maximum noise rating of 45 dbA with power on or in the running or driving mode.

F. Damper actuators must be furnished with NEMA 4X enclosures and must have a shaft seal and all electrical connections must be suitable for the space classification Enclosure must be UL listed.

2.6 RELAYS

A. General-Purpose Relays:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Omron.
    b. Schneider Electric.
    c. Siemens Industry, Inc., Building Technologies Division.

2. Relays shall be heavy duty and rated for at least 10 A at 250-V ac and 60 Hz.
3. Relays shall be either double pole double throw (DPDT) or three-pole double throw, depending on the control application.
4. Use a plug-in-style relay with an eight-pin octal plug for DPDT relays and an 11-pin octal plug for three-pole double-throw relays.
5. Construct the contacts of either silver cadmium oxide or gold.
6. Enclose the relay in a clear transparent polycarbonate dust-tight cover.
7. Relays shall have LED indication and a manual reset and push-to-test button.
8. Performance:

    a. Mechanical Life: At least 10 million cycles.
    b. Electrical Life: At least 100,000 cycles at rated load.
    c. Pickup Time: 15 ms or less.
    d. Dropout Time: 10 ms or less.
    e. Pull-in Voltage: 85 percent of rated voltage.
    f. Dropout Voltage: 50 percent of nominal rated voltage.
    g. Power Consumption: 2 VA.
    h. Ambient Operating Temperatures: Minus 40 to 115 deg F.

9. Equip relays with coil transient suppression to limit transients to non-damaging levels.
10. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
11. Relay socket shall have screw terminals. Mold into the socket the coincident screw terminal numbers and associated octal pin numbers.

2.7 ELECTRICAL POWER DEVICES

A. Transformers:

1. Transformer shall be sized for the total connected load, plus an additional 25 percent of connected load.
2. Transformer shall be at least 40 VA.
3. Transformer shall have both primary and secondary fuses.

2.8 WIRE AND CABLE

A. Field wiring between ATC panels, control devices, unitary control panel, and HVAC equipment controllers shall be furnished under this Section and shall conform to the requirements of Division 26.

B. Wire: Single conductor control wiring:

1. Wire size shall be at least No. 14 AWG.
2. Conductor shall be 7/24 soft annealed copper strand with 2- to 2.5-inch lay.
3. Conductor insulation shall be 600 V, Type THWN or Type THHN, and 90 deg C according to UL 83.
4. Conductor colors shall be black (hot), white (neutral), and green (ground).
5. Furnish wire on spools.

C. Single Twisted Shielded Instrumentation Cable above 24 V:

1. Wire size shall be a minimum No. 16 AWG.
2. Conductors shall be a twisted, 7/24 soft annealed copper strand with a 2- to 2.5-inch lay.
3. Conductor insulation shall have a Type THHN/THWN or Type TFN rating.
4. Shielding shall be 100 percent type, 0.35/0.5-mil aluminum/Mylar tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
5. Outer jacket insulation shall have a 600-V, 90-deg C rating and shall be Type TC cable.
6. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.
7. Furnish wire on spools.

D. Single Twisted Shielded Instrumentation Cable 24 V and Less:

1. Wire size shall be a minimum No. 16 AWG.
2. Conductors shall be a twisted, 7/24 soft annealed copper stranding with a 2- to 2.5-inch lay.
3. Conductor insulation shall have a nominal 15-mil thickness, constructed from flame-retardant PVC.
4. Shielding shall be 100 percent type, 1.35-mil aluminum/polymer tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
5. Outer jacket insulation shall have a 300-V, 105-deg C rating and shall be Type PLTC cable.
6. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.
7. Furnish wire on spools.

E. For all other wiring:

1. Conform to requirements of Section 260519 “Low-Voltage Electrical Power Conductors and Cables.”

2.9 RACEWAYS

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

2.10 IDENTIFICATION

A. Control Equipment, Instruments, and Control Devices:

1. Self-adhesive label bearing unique identification:

a. Include instruments with unique identification identified by equipment being controlled or monitored, followed by point identification.

2. Letter size shall be as follows:

a. Enclosures: Minimum of 0.5 inch high.
b. Electrical Power Devices: Minimum of 0.25 inch high.
c. Instruments: Minimum of 0.25 inch high.
d. Control Damper and Valve Actuators: Minimum of 0.25 inch high.

3. Legend shall consist of white lettering on black background.
4. Laminated acrylic or melamine plastic sign shall be engraved phenolic consisting of three layers of rigid laminate. Top and bottom layers are color-coded black with contrasting white center exposed by engraving through outer layer and shall be fastened with drive pins.
5. Instruments, control devices and actuators with Project-specific identification tags having unique identification numbers following requirements indicated and provided by original manufacturer do not require additional identification.

B. Raceway and Boxes:

1. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
2. Paint cover plates on junction boxes and conduit same color as the tape banding for conduits. After painting, label cover plate "HVAC Controls," using an engraved phenolic tag.

C. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

D. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

E. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

F. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Brady Corporation.
   b. Carlton Industries, LP.
   c. emedco.
   d. Marking Services, Inc.

2. Engraved legend.
3. Thickness:

   a. For signs up to 20 sq. in., minimum 1/16 inch thick.
   b. Engraved legend with black letters on white face.
   c. Self-adhesive.
   d. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

G. Equipment Warning Labels:

1. Self-adhesive label with pressure-sensitive adhesive back and peel-off protective jacket.
2. Lettering size shall be at least 14-point type with white lettering on red background.
3. Warning label shall read "CAUTION-Equipment operated under remote automatic control and may start or stop at any time without warning. Switch electric power disconnecting means to OFF position before servicing."
4. Lettering shall be enclosed in a white line border. Edge of label shall extend at least 0.25 inch beyond white border.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work:

1. Verify compatibility with and suitability of substrates.

B. Examine roughing-in for products to verify actual locations of connections before installation:

1. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
2. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install products to satisfy more stringent of all requirements indicated.

B. Install products level, plumb, parallel, and perpendicular with building construction.

C. Support products, tubing, piping wiring and raceways.

D. If codes and referenced standards are more stringent than requirements indicated, comply with requirements in codes and referenced standards.

E. Fabricate openings and install sleeves in floors, roof, and walls required by installation of products. Before proceeding with drilling, punching, and cutting, check for concealed work to avoid damage. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

F. Firestop Penetrations Made in Fire-Rated Assemblies: Comply with requirements in Section 078413 "Penetration Firestopping."

G. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that damage surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening fasteners.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts and screws with graphite and oil before assembly.

H. If product locations are not indicated, install products in locations that are accessible and that will permit service and maintenance from floor, equipment platforms, or catwalks without removal of permanently installed furniture and equipment.

I. Corrosive Environments:

1. Avoid or limit use of materials in corrosive airstreams and environments, including, but not limited to, the following:

    a. Process exhaust-air streams.

2. Comply with requirements for installation of raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
3. Where instruments are located in a corrosive airstream and are not corrosive resistant from manufacturer, field install products in NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.3 ENCLOSURES INSTALLATION

A. Install the following items in enclosures, to comply with indicated requirements:

1. Electrical power devices.
2. Relays.
3. Accessories.
4. Instruments.
5. Actuators

B. Attach wall-mounted enclosures to wall using the following types of steel struts:

1. For NEMA 250, Type 4X Enclosures Located Outdoors: Use stainless-steel strut and hardware.

2. For NEMA 250, Type 4X Enclosures Located Indoors in Corrosive Spaces: Use FRP strut.
3. Install plastic caps on exposed cut edges of strut.

C. Align top of adjacent enclosures.

D. Install floor-mounted enclosures located on concrete housekeeping pads. Attach enclosure legs using galvanized-steel anchors.

3.4 ELECTRIC POWER CONNECTIONS

A. Connect electrical power to ATC system products requiring electrical power connections.

B. Design of electrical power to products not indicated with electric power is delegated to ATC system provider and installing trade. Work shall comply with NFPA 70 and other requirements indicated.

C. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical power conductors and cables.

D. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

3.5 IDENTIFICATION

A. Install self-adhesive labels with unique identification on face for each of the following:

1. Device enclosure.
2. Electrical power device.

B. Install laminated acrylic or melamine sign with unique identification on face of ATC controller enclosures.

C. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes or self-adhesive labels with the conductor designation.

D. Install unique instrument identification on face of each instrument connected to a ATC controller.

E. Install unique identification on face of each control damper and valve actuator connected to a ATC controller.

F. Warning Labels and Signs:

1. Shall be permanently attached to equipment that can be automatically started by ATC control system.
2. Shall be located in highly visible location near power service entry points.

3.6 WIRE, CABLE AND RACEWAYS INSTALLATION

A. Wiring, cable and raceway installation to be done under this Section shall consist of, but not be limited to, the following:

1. Between ATC panels and MCCs.
2. Between ATC panels and all sensors and switches.
3. Between ATC panels and all operators, actuators, and controllers.
4. Between ATC panels and control panels on equipment provided by the HVAC contractor.
5. Between alarm devices provided by the other trades and ATC panels.
6. Power wiring from ATC panels to actuators, switches and sensors.
7. Between ATC panels and existing HVAC equipment to be shut down when the chlorine scrubber is operating.
8. Between all equipment and components required to fulfill the sequences of operation on the Drawings.

B. Refer to Electrical Drawings for details of wiring at motor control panels. Provide interconnecting wiring to start and stop motors.

C. Comply with NECA 1.

D. Wire and Cable Installation:

1. Comply with installation requirements in Section 260523 "Control-Voltage Electrical Power Cables."
2. Install cables with protective sheathing that is waterproof and capable of withstanding continuous temperatures of 90 deg C with no measurable effect on physical and electrical properties of cable.

    a. Provide shielding to prevent interference and distortion from adjacent cables and equipment.

3. Terminate wiring in a junction box:

    a. Clamp cable over jacket in junction box.
    b. Individual conductors in the stripped section of the cable shall be slack between the clamping point and terminal block.

4. Terminate field wiring and cable not directly connected to instruments and control devices having integral wiring terminals using terminal blocks.
5. Install signal transmission components according to IEEE C2, REA Form 511a, NFPA 70, and as indicated.
6. Use shielded cable to transmitters.
7. Use shielded cable to temperature sensors.
8. Perform continuity and meager testing on wire and cable after installation.

E. Conduit Installation:

1. Comply with Section "260533 "Raceways and Boxes for Electrical Systems" for control-voltage conductors.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Testing:

1. Perform preinstallation, in-progress, and final tests, supplemented by additional tests, as necessary.
2. Preinstallation Cable Verification: Verify integrity and serviceability for new cable lengths before installation. This assurance may be provided by using vendor verification documents, testing, or other methods. As a minimum, furnish evidence of verification for cable attenuation and bandwidth parameters.
3. In-Progress Testing: Perform standard tests for correct pair identification and termination during installation to ensure proper installation and cable placement. Perform tests in addition to those specified if there is any reason to question condition of material furnished and installed. Testing accomplished is to be documented by agency conducting tests. Submit test results for Project record.
4. Final Testing: Perform final test of installed system to demonstrate acceptability as installed. Testing shall be performed according to a test plan supplied by ATC system manufacturer. Defective Work or material shall be corrected and retested. As a minimum, final testing for cable system, including spare cable, shall verify conformance of attenuation, length, and bandwidth parameters with performance indicated.
5. Test Equipment: Use an optical fiber time domain reflectometer for testing of length and optical connectivity.
6. Test Results: Record test results and submit copy of test results for Project record.

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3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain ATC system.

B. Extent of Training:

1. Base extent of training on scope and complexity of ATC system indicated and training requirements indicated. Provide extent of training required to satisfy requirements indicated even if more than minimum training requirements are indicated.
2. Inform Owner of anticipated training requirements if more than minimum training requirements are indicated.
3. Minimum Training Requirements:

    a. Provide not less than one days of training total.
    b. All training shall occur before end of warranty period.

END OF SECTION 230923

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SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233116 "Nonmetal Ducts" for thermoset fiber-reinforced plastic ducts.
3. Section 233300 "Air Duct Accessories" for dampers, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top and bottom of ducts.
5. Dimensions of all duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.

11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: A single set of plans, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of aluminum unless otherwise indicated.

B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing

requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of aluminum unless otherwise indicated.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ductmate Industries, Inc.
    b. Elgen Manufacturing.
    c. McGill AirFlow LLC.

B. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10 inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

D. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Corrosive Environments: 316 stainless steel.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables: Stainless steel complying with ASTM A 492.

D. Steel Cable End Connections: stainless steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: stainless steel sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports: stainless-steel shapes and plates.

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PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.

B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

H. Route ducts to avoid passing electrical equipment rooms and enclosures.

I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

J. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation.

K. Elbows: Use long-radius elbows wherever they fit:

1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

L. Branch Connections: Use lateral or conical branch connections.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

D. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached:

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 STARTUP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.7 DUCT SCHEDULE

A. Fabricate ducts with aluminum sheet except as otherwise indicated and as follows:

B. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.

C. Exhaust Ducts:

1. Ducts Connected to Exhaust Fans:

a. Pressure Class: Negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class: 2.

D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Pressure Class: Positive 2-inch wg.

a. Minimum SMACNA Seal Class: A.

E. Intermediate Reinforcement:

1. Aluminum Ducts: Aluminum.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible,"

Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments:

1) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Conical spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees."

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

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SECTION 233116 – NON-METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thermoset FRP ducts and fittings.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for nonmetal ducts.
2. Section 233113 "Metal Ducts" for single- and double-wall, rectangular and round ducts.
3. Section 233300 "Air Duct Accessories" for dampers, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including duct closure, reinforcements, and hangers and supports, shall comply with SMACNA's "Fibrous Glass Duct Construction Standards" and performance requirements and design criteria indicated:

1. Static-Pressure Classes:

a. Exhaust Ducts (Negative Pressure): 2-inch wg.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Thermoset FRP duct materials.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Duct layout indicating sizes and pressure classes.
3. Elevation of top of ducts.

4. Dimensions of main duct runs from building grid lines.
5. Fittings.
6. Reinforcement and spacing.
7. Seam and joint construction.
8. Penetrations through fire-rated and other partitions.
9. Equipment installation based on equipment being used on Project.
10. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Structural members to which duct will be attached.

PART 2 - PRODUCTS

2.1 THERMOSET FRP DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Perry Fiberglass Products, Inc.
2. Spunstrand
3. Monoxivent
4. Or equal

B. Duct and Fittings:

1. Thermoset FRP Resin: Manufacture duct with resin that complies with UL 181, Class 1, maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL according to ASTM E 84.
2. Inner Liner: FSK liner rated by an NRTL to comply with UL 181, Class 1.
3. Round Duct: ASTM D 2996, Type I, Grade 2, Class E, filament-wound duct, minimum 0.125-inch wall thickness, with tapered bell and spigot ends for adhesive joints, or plain ends with couplings.
4. Round Fittings: Compression or spray-up/contact, molded of same material, pressure class, and joining method as duct.
5. Rectangular Fittings: Minimum 0.125-inch- thick flat sheet with fiberglass roving and resin-reinforced joints and seams.

C. Joining Materials: Roving and polyester resin.

D. Fabrication:

1. Fabricate joints, seams, transitions, reinforcement, elbows, branch connections, and access doors and panels according to SMACNA's "Thermoset FRP Duct Construction Manual," Chapter 7, "Requirements."
2. Fabricate 90-degree rectangular mitered elbows to include turning vanes, 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

E. Drains: Formed drain pockets with a minimum of NPS 1 threaded pipe connections, provided with stainless steel ball valve.

2.2 HANGERS AND SUPPORTS

A. Hanger Rods for Corrosive Environments: 316 stainless steel.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables: ASTM A 492, stainless steel with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

D. Duct Attachments: stainless steel sheet metal screws, blind rivets, or self-tapping metal screws.

E. Trapeze and Riser Supports: 316 stainless steel.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Install ducts with fewest possible joints.

B. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

C. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

D. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

E. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges. Overlap openings on four sides by at least 1-1/2 inches.

F. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

G. Protect duct interiors from the moisture, construction debris and dust, and other foreign materials.

H. Install thermoset FRP ducts and fittings to comply with SMACNA's "Thermoset FRP Duct Construction Manual."

3.2 HANGER AND SUPPORT INSTALLATION

A. Install hangers and supports for thermoset FRP ducts and fittings to comply with SMACNA's "Thermoset FRP Duct Construction Manual," Chapter 7, "Requirements."

B. Building Attachments: Concrete inserts, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

C. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.5 DUCT SCHEDULE

A. Chlorine Scrubber Exhaust Ducts and Fittings:

1. Thermoset FRP Round Ducts and Fittings.

END OF SECTION 233116

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SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manual volume dampers.
2. Control dampers.
3. Turning vanes.
4. Duct-mounted access doors.
5. Flexible connectors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control-damper installations.
d. Wiring Diagrams: For power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

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PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 or G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 MANUAL VOLUME DAMPERS

A. Standard, FRP, Manual Volume Dampers (Chlorine Scrubber FRP Exhaust Duct):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Perry Fiberglass Products, Inc.
b. Spunstrand.
c. Monoxivent
d. MK Plastics

2. Suitable for horizontal or vertical applications.
3. Frames:

a. Fiberglass.

4. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Fiberglass vinyl ester resin.

5. Blade Axles: Fiberglass vinyl ester resin.
6. Bearings:

    a. Teflon.

B. Standard, Aluminum, Manual Volume Dampers:
1. Standard leakage rating.
2. Suitable for horizontal or vertical applications.
3. Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
4. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
    e. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.

5. Blade Axles: Stainless steel.
6. Bearings:

    a. Stainless-steel sleeve.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

7. Tie Bars and Brackets: Aluminum.

2.4 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Ruskin Company.

B. Low-leakage rating and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

1. Hat or U shaped.
2. 0.094-inch- thick galvanized sheet steel.
3. Interlocking, gusseted corners.

D. Blades:

1. Multiple blade with maximum blade width of 6 inches.
2. Parallel or Opposed-blade design.
3. Aluminum.
4. 0.064 inch thick single skin.
5. Blade Edging: Closed-cell neoprene or PVC.

E. Blade Axles: 1/2-inch- diameter; galvanized steel or stainless steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

F. Bearings:

1. Molded synthetic or Stainless-steel sleeve.

2.5 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Aero-Dyne Sound Control Co.
2. Ductmate Industries, Inc.
3. METALAIRE, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

E. Vane Construction: Single wall.

2.6 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Aire Technologies.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 1-by-1-inchbutt or piano hinge and cam latches.
e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

2.7 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.

1. Minimum Weight: 14 oz./sq. yd..
2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
   1. Install aluminum volume dampers in aluminum ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
   1. Downstream from manual volume dampers and control dampers.
   2. Upstream from turning vanes.
   3. Control devices requiring inspection.
   4. Elsewhere as indicated.

G. Install access doors with swing against duct static pressure.

H. Install flexible connectors to connect ducts to equipment.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

   1. Operate dampers to verify full range of movement.
   2. Inspect locations of access doors and verify that purpose of access door can be performed.
   3. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

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SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sidewall propeller fans.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
2. Rated capacities, operating characteristics, and furnished specialties and accessories.
3. Certified fan performance curves with system operating conditions indicated.
4. Certified fan sound-power ratings.
5. Motor ratings and electrical characteristics, plus motor and electrical accessories.
6. Material thickness and finishes, including color charts.
7. Dampers, including housings, linkages, and operators.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For HVAC power ventilators to include in normal and emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:

1. Belts: One set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Capacities and Characteristics: Refer to Schedule on Drawings.

2.2 SIDEWALL PROPELLER FANS

A. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring, with baked-enamel finish coat applied after assembly.

B. Fan Wheel: Replaceable, cast or extruded-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.

C. Fan Drive:

1. Belt drive.
2. Resiliently mounted to housing.
3. Statically and dynamically balanced.
4. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
5. Extend grease fitting to accessible location outside of unit.
6. Service Factor Based on Fan Motor Size: 1.4.
7. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
8. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
9. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
10. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
11. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
12. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

D. Accessories:

1. Disconnect Switch: Nonfusible type, mounted inside fan housing, factory wired through an internal aluminum conduit.
2. Motorized Dampers: Parallel-blade dampers with electric actuator wired to close when fan stops.
3. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.4 SOURCE QUALITY CONTROL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

B. AMCA Certification: Fans shall comply with AMCA 11 and bear the AMCA-Certified Ratings Seal.

C. Fan Sound Ratings: Comply with AMCA 311, and label fans with the AMCA-Certified Ratings Seal. Sound ratings shall comply with AMCA 301. The fans shall be tested according to AMCA 300.

D. Fan Performance Ratings: Comply with AMCA 211 and label fans with AMCA-Certified Rating Seal. The fans shall be tested for air performance - flow rate, fan pressure, power, fan efficiency, air density, speed of rotation, and fan efficiency - according to AMCA 210/ASHRAE 51.

E. Operating Limits: Classify according to AMCA 99.

F. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

PART 3 - EXECUTION

3.1 INSTALLATION OF HVAC POWER VENTILATORS

A. Install power ventilators level and plumb.

B. Install units with clearances for service and maintenance.

C. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 DUCTWORK CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1:

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.4 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that there is adequate maintenance and access space.
4. Verify that cleaning and adjusting are complete.
5. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
6. Adjust belt tension.
7. Adjust damper linkages for proper damper operation.
8. Verify lubrication for bearings and other moving parts.
9. Verify that manual volume control in connected ductwork systems are in fully open position.
10. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
11. Shut unit down and reconnect automatic temperature-control operators.
12. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans.

END OF SECTION 233423

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SECTION 260505 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Removal of existing electrical equipment, wiring, and conduit in areas to be remodeled; removal of designated construction; dismantling, cutting and alterations for completion of the Work.
2. Disposal of materials.
3. Storage of removed materials.
4. Protection of items to remain as indicated on Drawings.
5. Relocate existing equipment to accommodate construction.

1.3 PRE-INSTALLATION MEETINGS

A. Section 013100 - Project Management and Coordination: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.4 SCHEDULING

A. Section 013100 - Project Management and Coordination: Requirements for scheduling.

B. Schedule work to coincide with new construction.

C. Cease operations immediately when structure appears to be in danger and notify Engineer/Owner. Do not resume operations until directed.

1.5 COORDINATION

A. Section 013100 - Project Management and Coordination: Requirements for coordination.

B. Conduct demolition to minimize interference with adjacent building areas.

C. Coordinate and sequence demolition so as not to cause shutdown of operation of surrounding areas.

D. Equipment, building or structures scheduled for complete demolition shall be made safe from electrical shock hazard prior to demolition.

E. Shut-down Periods:

1. Arrange timing of shut-down periods of in service panels with Owner. Do not shut down any utility without prior written approval.
2. Keep shut-down period to minimum or use intermittent period as directed by Owner
3. Maintain life-safety systems in full operation in occupied facilities, or provide notice minimum 3 days in advance.

F. Identify salvage items in cooperation with Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017300 - Execution: Verification of existing conditions before starting work.

B. Verify wiring and equipment indicated to be demolished serve only abandoned facilities.

C. Verify termination points for demolished services.

3.2 PREPARATION

A. Erect, and maintain temporary safeguards, for protection of the public, Owner, Contractor's employees, and existing improvements to remain.

B. Temporary egress signage and emergency lighting

3.3 REMOVAL AND DISPOSAL OF LEGALLY REGULATED MATERIALS

A. Material and equipment indicated to be removed and disposed of will become the Contractor's property. Dispose of material and equipment offsite, unless otherwise directed by the Owner. Provide the Owner with a receipt indicating the acceptable disposal of any legally regulated materials or equipment.

3.4 DEMOLITION

A. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Owner before disturbing existing installation.

B. Remove exposed abandoned conduit. Cut conduit flush with walls and floors, and patch surfaces.

C. Remove conduit, wire, boxes, and fastening devices to avoid any interference with new installation.

D. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

E. Reconnect equipment being disturbed by renovation work and required for continue service to or nearest available panel.

F. Disconnect or shut off service to areas where electrical work is to be removed. Remove electrical fixtures, equipment, and related switches, outlets, conduit and wiring which are not part of final project.

G. Install temporary wiring and connections to maintain existing systems in service during construction.

H. Perform work on energized equipment or circuits with experienced and trained personnel.

I. Remove, relocate, and extend existing installations to accommodate new construction.

J. Repair adjacent construction and finishes damaged during demolition and extension work.

K. Remove exposed abandoned grounding and bonding components, fasteners and supports, and electrical identification components. Cut embedded support elements flush with walls and floors.

L. Clean and repair existing equipment to remain.

M. Protect and retain power to existing active equipment remaining.

N. Cap abandoned empty conduit at both ends.

3.5 EXISTING PANELBOARDS

A. Ring out circuits in existing panel affected by the Work. Where additional circuits are needed, reuse circuits available for reuse. Install new breakers.

B. Tag unused circuits as spare.

C. Where existing circuits are indicated to be reused, use sensing measuring devices to verify circuits feeding Project area or are not in use.

D. Remove existing wire no longer in use from panel to equipment.

E. Provide new updated directories where more than three circuits have been modified or rewired.

3.6 REUSABLE ELECTRICAL EQUIPMENT

A. Carefully remove equipment, materials, or fixtures which are to be reused.

B. Disconnect, remove, or relocate existing electrical material and equipment interfering with new installation.

3.7 CLEANING

A. Remove demolished materials as work progresses. Legally dispose.

B. Keep workplace neat.

END OF SECTION 260505

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.

1.3 DEFINITIONS

A. RoHS: Restriction of Hazardous Substances.

B. THHN Thermoplastic High Heat-resistant Nylon-coated

C. THWN: Thermoplastic Heat and Water-resistant Nylon-coated

D. XHHW: XLPE (Cross-linked polyethylene) High Heat-resistant Water-resistant

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

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PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Prysmian Group/General Cable Technologies Corporation.
2. Okonite Company.
3. Service Wire Co.
4. Southwire Company.
5. Encore Wire Corporation

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type THW: Comply with NEMA WC-70/ICEA S-95-658 and UL 83
3. Type XHHW-2: Comply with UL 44.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M Electrical Products.
2. Hubbell Incorporated, Power Systems.
3. Appleton-OZ/Gedney (Emerson).
4. ABB

C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: Two] hole with standard barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders/Branch Circuits: Copper; stranded for all sizes.

B. Soft-draw copper conductors with Class B stranding, per ASTM B8

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. 480V Feeders: Type XHHW-2, single conductors in raceway.

B. 240/120V and 208/120V Feeders and Branch Circuits: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each of the following visual and electrical tests:

   a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
   b. Test bolted connections for high resistance using one of the following:

      1) A low-resistance ohmmeter.
      2) Calibrated torque wrench.
      3) Thermographic survey.

   c. Inspect compression-applied connectors for correct cable match and indentation.
   d. Inspect for correct identification.
   e. Inspect cable jacket and condition.
   f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
   g. Continuity test on each conductor and cable.
   h. Uniform resistance of parallel conductors.

B. Cables will be considered defective if they do not pass tests and inspections.

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C. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

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SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Instrumentation and control cabling.
2. Control-circuit conductors.

B. Related Requirements:

1. Section 260529 “Hangers and Supports for Electrical Systems”
2. Section 260533 “Raceways and Boxes for Electrical Systems.”
3. Section 260553 “Identification for Electrical Systems.”
4. Section 271313 “Communications Copper Backbone Cabling”.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. Instrumentation control cable: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

C. Plenum: A space forming part of the air distribution system to which one ore more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency:

1. Flame Travel Distance: 60 inches or less.
2. Peak Optical Smoke Density: 0.5 or less.
3. Average Optical Smoke Density: 0.15 or less.

C. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.

D. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

E. RoHS compliant.

2.2 INSTRUMENTATION CONTROL CABLE

A. Manufacturers: Subject to compliance with requirements, available to manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

1. Belden
2. Prysmian Group/General Cable Technologies Corporation
3. Alpha Wire

B. Paired Cable: NFPA 70, Type CMG:

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation. 300 Volt, 105 degrees C rating.
3. Shielded: 100 percent Aluminum/polyester foil with drain wire.
4. PVC jacket with UL subject 1277 TC, UL 1581 and manufacturers' identification
5. Flame Resistance: Comply with UL 1685.

2.3 CONTROL-CIRCUIT CONDUCTORS

A. All control circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

B. Class B stranded soft annealed copper per ASTM B3 or B33 conforming to ASTM B8, 14 AWG.

C. All cables shall be tested in accordance with the requirements of NEMA WC 57/ICEA S-73-552 and flame test requirements of IEEE 1202.

D. Control wiring shall have 600 Volt insulation, except where indicated otherwise.

E. Manufacturers: Subject to compliance with requirements, available to manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

1. Prysmian Group/General Cable Technologies Corporation.
2. Okonite Company.
3. Service Wire Co.
4. Southwire Company.
5. Encore Wire Corporation.

2.4 SOURCE QUALITY CONTROL

A. Factory test twisted pair cables according to TIA-568-C.2.

B. Cable will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Test cables on receipt at Project site:

1. Test each pair of twisted pair cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.

B. Raceway Installation:

1. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
2. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
3. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
4. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
5. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
6. Pulling Cable: Comply with manufacturer's recommendations.
7. Support: Do not allow cables to lie on removable ceiling tiles.
8. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
9. Provide strain relief.
10. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
11. Ground wire shall be copper, and grounding methods shall comply with IEEE C2. Demonstrate ground resistance.

C. Installation of Instrumentation cables and Control-Circuit Conductors:

1. Install wiring in raceways.
2. Use insulated spade lugs for wire and cable connection to screw terminals.
3. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."

3.4 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

3.5 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes: No 14 AWG.

3.6 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 GROUNDING

A. For instrumentation control cables and control wiring, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire shall have a unique tag.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 260523

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

A. Insulated Equipment Grounding Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction. Conductor insulation shall be Type THW and shall be green.

B. Bare Copper Conductors: Stranded Conductors: ASTM B8.

C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Prysmian Group/General Cable Technologies Corporation.
2. Okonite Company.
3. Service Wire Co.
4. Southwire Company.
5. Encore Wire Corporation.

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2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Conduit Hubs: Mechanical type, terminal with threaded hub.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install stranded conductors for all size cables.

B. Grounding Conductors: Green-colored insulation.

C. Conductor Terminations and Connections:

1. Equipment Grounding Conductor Terminations: Bolted connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.3 FIELD QUALITY CONTROL

A. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF SECTION 260526

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SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit support devices.
3. Structural steel for fabricated supports and restraints.
4. Mounting, anchoring, and attachment components, including mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Slotted support systems, hardware, and accessories.
b. Clamps.
c. Hangers.
d. Sockets.
e. Eye nuts.
f. Fasteners.
g. Anchors.
h. Saddles.
i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems:

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.

4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M – Structural Welding Code – Steel.
2. AWS D1.6/D1.6M – Structural Welding Code – Stainless Steel.
3. AWS D1.7/D1.7M. – Guide for Strengthening and Repairing Existing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency:

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. In dry and “DAMP” indoor areas, hangers, rods, backplates, beam clamps, channel, etc. shall be hot dipped galvanized steel.

B. Fiberglass channel with stainless steel hardware shall be used in areas designated "WET" or "CORROSIVE" on the Drawings and in outdoor locations. Fiberglass channel shall be resistant to the chemicals present in the area in which it is used.

C. Furnish any and all necessary supports, brackets, conduit sleeves, racks and bracing as required. All boxes and hardware shall be galvanized zinc plated steel except that stainless steel shall be used in areas designated as "WET" and fiberglass reinforced plastic boxes in "CORROSIVE" areas on the Drawings.

D. Conduit Supports:

1. Trapezes:

a. In dry and “DAMP” indoor areas, beams, channels, struts, hangers, bracing, rods, beam clamps, accessories and components shall be hot dipped galvanized steel.

b. Fiberglass beams, channels, struts with stainless steel hangers, bracing, rods, beam clamps, accessories and components shall be used in areas designated "WET" and "CORROSIVE" where indicated and in outdoor locations. Fiberglass channels shall be resistant to the chemicals present in the area in which it is used.

2. Flush Mounted Supports:

a. In dry and "DAMP" indoor areas, channels, struts, accessories and components shall be hot dipped galvanized steel.
b. Fiberglass channels, struts with stainless, accessories and components shall be used in areas designated "WET" and "CORROSIVE" where indicated and in outdoor locations. Fiberglass channels, struts shall be resistant to the chemicals present in the area in which it is used.

3. Conduit Racks:

a. In dry and "DAMP" indoor areas, conduit racks, accessories and components shall be hot dipped galvanized steel.
b. Fiberglass conduit racks with stainless, accessories and components shall be used in areas designated "WET" and "CORROSIVE" where indicated and in outdoor locations. Fiberglass channels shall be resistant to the chemicals present in the area in which it is used.

4. Conduit Hangers:

a. In dry or "DAMP" indoor areas, conduit clamps, rods, beam clamps, bracing, accessories and components shall be hot dipped galvanized steel.
b. Stainless steel conduit clamps, rods, beam clamps, bracing, accessories and components shall be used in areas designated "WET" and "CORROSIVE" where indicated and in outdoor locations.

E. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. B-line; Eaton, Electrical Sector.
b. CADDY; nVent.
c. Unistrut; Atkore International.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: Galvanized steel .
4. Channel Width: Selected for applicable load .
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

F. Conduit and Cable Support Devices: Stainless-steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

G. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

H. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A F3125/F3125M, Grade A325 (Grade A325M).
5. Toggle Bolts: Stainless-steel springhead type.
6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA 101

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits. Secure raceways to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA 1, RMC may be supported by openings through structure members, according to NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To New Concrete: Bolt to concrete inserts.
2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
3. To Existing Concrete: Expansion anchor fasteners:
4. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
5. To Light Steel: Sheet metal screws.
6. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Concrete materials, reinforcement, and placement requirements shall meet the requirements of Div. 03 and the structural drawings.

C. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 260529

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SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Boxes, enclosures, and cabinets.

B. Related Requirements:

1. Section 260529 "Hangers and Supports for Electrical Systems" for conduit support requirements.
2. Section 260544 “Sleeves and Sleeve Seals for Electrical Raceways and Cabling” for sleeve and seal requirements.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. LFMC: Liquide-tight flexible metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Furnish and install complete raceway systems as shown on the Drawings and as specified herein. Raceways and conductors are not shown completely on the Drawings. Conduit and wiring descriptions are indicated on the one-line diagrams and riser diagrams. Home runs indicated are to assist the Contractor in identifying raceways to be installed concealed or exposed. Raceways and conductors shall be provided for a complete and operating system. Raceways indicated to be run exposed on the Drawings shall be run near the ceilings or along

the walls of the areas through which they pass and shall be routed to avoid conflicts with HVAC ducts, cranes and hoists, lighting fixtures, doors and hatches, etc. Raceways indicated to be run concealed shall be run in the center of concrete floor slabs, in partitions, or above hung ceilings, as required.

B. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

2.2 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. GRC: Comply with ANSI C80.1 and UL 6:

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) Allied Tube & Conduit; a part of Atkore International.
        2) Calconduit, a part of Atkore International.
        3) Western Tube and Conduit Corporation.
        4) Wheatland Tube Company.

3. PVC-Coated Steel Conduit: PVC-coated GRC.

    a. Comply with NEMA RN 1.
    b. Coating Thickness: 0.040 inch, minimum.
    c. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) Perma-Cote, as manufactured by Robroy industries.
        2) Plasti-Bond, as manufactured by Robroy industries.
        3) Ocal, as manufactured by Thomas & Betts; A Member of the ABB Group.
        4) Calbond, a part of Atkore International.

4. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360:

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) AFC Cable Systems; a part of Atkore International.
        2) Anamet Electrical, Inc.
        3) Electri-Flex Company.

B. Metal Fittings:

1. Comply with NEMA FB 1 and UL 514B.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Fittings for GRC:

    a. Rigid steel conduit fittings shall be of the threaded type, and shall be steel with a hot-dipped galvanized finish. Threadless fittings and split couplings are not allowed.
    b. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) O-Z/Gedney; a brand of Emerson Industrial Automation
        2) Thomas & Betts Corporation; A Member of the ABB Group.
        3) RACO, a Hubbell Company.

5. Expansion Fittings: Steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
6. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints. The PVC coated couplings, factory elbows, and fittings shall be supplied by the same manufacturer as the PVC coated conduit.
7. Fittings for LFMC:

    a. Liquid-tight conduit fittings shall be hot-dipped mechanically galvanized, positive grounding, screw in type.
    b. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) O-Z/Gedney; a brand of Emerson Industrial Automation.
        2) Thomas & Betts Corporation; A Member of the ABB Group.
        3) RACO, a Hubbell Company.

C. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity

2.3 MISCELLANEOUS FITTINGS

A. Flexible Couplings:

1. Manufacturers: Provide products by one of the following:

    a. "Type ECGJH," by the Crouse-Hinds Co.
    b. Appleton Electric Co.

c. Killark Electric Manufacturing Co.
d. Or equal.

B. Conduit Hubs:

1. Manufacturers: Provide products by one of the following:

a. Myers Electric Products, Inc.
b. Or equal.

C. Conduit Wall Seals for Cored Holes:

1. Products: Provide one of the following:

a. Type CSMC as manufactured by the O.Z./Gedney Co.
b. Link-Seal, as manufactured by Crouse-Hinds Co.
c. Or equal.

D. Conduit Wall and Floor Seals for Sleeved Openings:

1. Products: Provide one of the following:

a. Type CSMI as manufactured by the O.Z./Gedney Co.
b. Or equal.

E. Combination Expansion-Deflection Fittings Installed Exposed:

1. Products: Provide one of the following:

a. Type XD as manufactured by Crouse-Hinds Co.
b. Type DX as manufactured by O.Z. Gedney Co.
c. Type DF as manufactured by Appleton Electric Co.
d. Or equal.

F. Conduit Sealing Bushings:

1. Products: Provide one of the following:

a. O.Z./Gedney, Type CSB.
b. Or equal.

G. Grounding Bushings: Malleable iron with integral insulated throat rated for 300 degrees F, with solderless lugs:

1. Products: Provide one of the following:

a. Crouse Hinds/Cooper, Series HGLL.
b. Appleton, Series GIB.
c. O.Z./Gedney, Type HBLG.
d. Or equal.

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2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hoffman, a product of nVent.
2. Wiegmann, a Hubbell Company.
3. Crouse-Hinds Co.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

D. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 12 hot dipped galvanized steel (for indoor areas designated as "DRY") and Type 4X 316 stainless steel (for areas designated as "DAMP", "WET", and for outdoor locations), and Type 4X fiberglass reinforced plastic (for areas designated as "Corrisive") with continuous-hinge cover with flush latch unless otherwise indicated.

E. Junction Boxes, Pull Boxes, and Enclosures:

1. NEMA 250, Type 12 hot dipped galvanized steel for indoor areas designated as "DRY". Covers shall be secured with round head brass machine screws. All joints shall be welded and ground smooth.
2. Type 4X 316 stainless steel for areas designated as "DAMP", "WET", and for outdoor locations. Boxes shall have continuously welded seams and mounting feet. Welds shall be ground smooth. Boxes shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. Covers shall be gasketed and fastened with stainless steel clamps.
3. Type 4X fiberglass reinforced plastic with stainless steel hardware and gasketed covers for areas designated as "CORROSIVE".

F. Cabinets:

1. NEMA 250, Type 4X 316 stainless steel box (for areas designated as "DAMP", "WET", and for outdoor locations), Type 4X fiberglass reinforced plastic (for areas designated as "Corrosive"), or Type 12 hot dipped galvanized steel box (for indoor areas designated as "DRY"), with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: PVC Coated Rigid Steel Conduit.
2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
3. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X 316 Stainless Steel

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Dry: GRC
2. Concealed in Ceilings and Interior Walls and Partitions: GRC.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC
4. Damp Locations: GRC.
5. Wet or Corrosive Locations: PVC Coated Rigid Steel Conduit
6. Boxes and Enclosures: NEMA 250, Type 12, except use NEMA 250, Type 4X 316 Stainless Steel in "DAMP" or "WET" locations, and Type 4X fiberglass reinforced boxes for Corrosive locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location:

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. Liquid-tight Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter.

C. Do not install raceways or electrical items on any rotating equipment.

D. Do not fasten conduits onto the bottom side of a metal deck roof.

E. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

F. Complete raceway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

H. Install no more than the equivalent of three 90-degree bends in any conduit run. Support within 12 inches of changes in direction.

I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

J. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches of enclosures to which attached.

L. Stub-Ups to Above Recessed Ceilings:

1. Use GRC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

M. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

N. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

O. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

P. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits. Conduits terminating in NEMA 4X metallic enclosures shall be terminated with Myers type Conduit hubs.

Q. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

R. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

S. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

T. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

U. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in all locations.

V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

W. Locate boxes so that cover or plate will not span different building finishes.

X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

Z. A maximum continuous run of conduit shall not exceed 300 feet and shall be reduced by 75 feet for each 90-degree elbow.

AA. Protect metallic finish conduit installed in contact with concrete or below grade with two coats of bitumastic paint, heat shrink tubing, or approved equivalent.

BB. Install conduit sealing and drain fittings on all conduits entering and leaving any area containing noxious gases to prevent contamination into clean areas via the conduit system. Areas requiring this protection are rooms where chlorine and ammonia, are stored, generated or heated. A sealing compound installation schedule shall be presented to Engineer for approval. Sign off on each installation and present the compound installation schedule to the Engineer for final sign-off. Each fitting shall be legibly marked with red paint to indicate that the sealing compound has been installed.

CC. Use liquid-tight flexible metal conduit for all motor terminations, the primary and secondary of transformers, generator terminations and other equipment where vibration is present or may require removal. The length of liquid-tight flexible metal conduit shall not exceed 36 incheswhen used for vibration isolation. Non-metallic flexible conduit shall only be allowed for use with rigid PVC conduit systems.

DD. Flexible couplings shall be used in hazardous locations for all motor terminations and other equipment where vibration is present.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

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SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Calpico, Flexicraft Industries, Metraflex, Proco Products.
2. Sealing Elements: EPDM or Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

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2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

C. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

D. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

F. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

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SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage.

B. Color-Coding for Identification, 600 V or Less: Use colors listed below for conductors.

1. Color shall be factory applied.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.
    d. Neutral: White.

3. Colors for 240/120-V Circuits (Single Phase):

    a. Phase A: Black.
    b. Phase B: Red.
    c. Neutral: White.

4. Colors for 480/277-V Circuits:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.
    d. Neutral: Gray.

5. Color for Equipment Grounds: Green.

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

D. Equipment Identification and Source Nameplates:

1. Black letters on a white field.
2. Nameplates shall be engraved, laminated plastic, not less than 1/16-inch thick by ¾-inch by 2-1/2-inch with 3/16-inch high lettering.

3. All electrical equipment furnished under Divisions 26 and all equipment control panels furnished under other Divisions shall include equipment identification nameplates. Equipment includes motor control centers, panelboards, transformers, disconnect switches, separately mounted motor controllers, control panels, named terminal cabinets, etc. The designation of the equipment shall correspond to the designation shown on the Drawings.
4. Equipment identified in the previous paragraph above shall also include a nameplate with the power source identified.

E. Device Identification Labels:

1. Black letters on a white field.
2. Labels shall be self-adhesive type and machine generated with ¼-inch high letters.
3. All receptacles, wall switches, lighting fixtures, instruments, etc. shall be identified with the panel and circuit to which it is connected.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends:

1. Manufacturers: Brady Corp, Panduit Corp, Marking Services, Emedco.

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action:

1. Manufacturers: Brady Corp, Panduit Corp, Marking Services.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- thick, polyester or vinyl flexible label with acrylic pressure-sensitive adhesive:

1. Manufacturers: Brady Corp, Panduit Corp, Marking Services, Emedco, Ideal Industries.
2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Polyester or Vinyl, thermal, transfer-printed, 3-mil- thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Manufacturers: Brady Corp, Panduit Corp, Marking Services, Emedco, Ideal Industries.
2. Minimum Nominal Size:

a. 1-1/2 by 6 inches for raceway and conductors.
b. 3-1/2 by 5 inches for equipment.
c. As required by authorities having jurisdiction.

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2.4 BANDS AND TUBES

A. Manufacturers: Brady Corp, Panduit Corp, Marking Services.

B. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters and that stay in place by gripping action.

C. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

2.5 TAPES AND STENCILS

A. Manufacturers: Brady Corp, Panduit Corp, Marking Services, Ideal Industries.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

D. Tape and Stencil: 4-inch- wide black stripes on 10-inch centers placed diagonally over orange background and are 12 inches wide. Stop stripes at legends.

2.6 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener:

1. Manufacturers: Brady Corp, Carlton Industries, Marking Services, Emedco.

B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

C. Write-on Tags:

1. Polyester Tags: 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

A. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

a. For signs up to 20 sq. in., minimum 1/16 inch thick.
b. For signs larger than 20 sq. in., 1/8 inch thick.
c. Engraved legend with black letters on white face.
d. Self-adhesive.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. Manufacturers: Hellermann Tyton, Ideal Industries, Marking Services, Panduit Corp.

B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon:

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

I. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

J. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

K. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

L. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

M. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.

N. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

O. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

P. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

Q. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility:

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

R. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

S. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

T. Metal Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using cable ties.

U. Nonmetallic Preprinted Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using cable ties.

V. Write-on Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using cable ties.

W. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high sign; where two lines of text are required, use labels 2 inches high.

X. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.

Y. Equipment Nameplates:

1. Nameplates shall be screw mounted to NEMA 1 enclosures.
2. Nameplates shall be bonded to all other enclosure types using an epoxy or similar waterproof adhesive.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways 600 V or Less, for Service, Feeder, and Branch Circuits: Identify with self-adhesive raceway labels:

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive vinyl tape to identify the phase.

E. Instrumentation Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.

F. Instrumentation Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.

G. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections:

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

H. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels:

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

a. Power-transfer switches.
b. Controls with external control power connections.

J. Operating Instruction Signs: Self-adhesive labels.

K. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label.
2. Outdoor Equipment:] Stenciled legend 4 inches high.
3. Equipment to Be Labeled:

a. Mini Power Zone
b. Ammonia Cabinets
c. Control Panels
d. Disconnect Switches

L. Junction and Pull Box Nameplates:

1. All voltages (e.g. 480 volts, 120 volts, etc.) within pull boxes, junction boxes etc. shall be identified on the front exterior cover. Provide Signs with red background with white engraved lettering. Provide lettering a minimum of 1 inch high.

M. Panelboard Identification:

1. Label branch circuit wires with associated pole number using vinyl cloth wrap around labels.
2. Provide typed as built circuit directories giving location and nature of load served. Install circuit directories in each panelboard.

END OF SECTION 260553

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SECTION 262733 - POWER DISTRIBUTION UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes freestanding, prepackaged power distribution units for transforming, conditioning, and distributing electrical power.

1.3 DEFINITIONS

A. SPD: Surge protection device.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for power distribution units.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power distribution units to include in operation and maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in fully enclosed vehicles after specified environmental conditions have been permanently established in spaces where equipment is to be placed.

B. Store equipment in spaces with environments controlled within manufacturer's ambient temperature and humidity tolerances for non-operating equipment.

1.7 FIELD CONDITIONS

A. Environmental Conditions: Units shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Storage Temperature Range: 32 to plus 104 deg F.
2. Operating Temperature Range: 0 to 104 deg F.
3. Relative Humidity Range: 0 to 95 percent, noncondensing.
4. Altitude: Sea level to 3300 feet above sea level.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.
2. Square D; Schneider Electric USA.

2.2 MANUFACTURED UNITS

A. Description: Integrated and coordinated assembly of power-line-conditioning and distribution components packaged in a single cabinet or modular assembly of cabinets. Include the following components:

1. Input-power, circuit-breaker section.
2. Isolation transformer.
3. Output panelboard.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

D. Wiring Access: Top wiring access.

E. Unit Capacity Rating: Carry indicated rms kilovolt-ampere load continuously without affecting the normal operation of the circuit breakers, monitoring system, or unit controls and without exceeding rated insulation temperature for the following input voltage and load current:

1. Input Voltage: Within rated input-voltage tolerance band of unit.
2. Load Current: Minimum of 3.0 crest factor and 85 percent total harmonic distortion.

2.3 INPUT-POWER, CIRCUIT-BREAKER SECTION

A. Description: Three-pole, thermal-magnetic-type circuit breaker, rated for indicated interrupting capacity and 125 percent of input current of unit at 100 percent rated load at unit capacity rating.

2.4 ISOLATION TRANSFORMER SECTION

A. Description: Dry-type, electrostatically shielded, three-phase, common-core, convection-air-cooled isolation transformer:

1. Comply with UL 1561.
2. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses, one leg per phase.
3. Coil Material and Insulation: Copper windings, 180 deg C insulation class.
4. Temperature Rise: Designed for 115 deg C rise above 40 deg C ambient.
5. Output Impedance: 3.5 plus or minus 0.5 percent.
6. Regulation: 2 to 4 percent maximum, at full-resistive load; 5 percent maximum, at rated nonlinear load.
7. Taps: 2 full-capacity compensation taps at 5 percent increments.
8. Magnetic-Field Strength External to Transformer Enclosure: Less than 0.1 gauss at 450 mm.

9. Electrostatic Shielding: Independently shield each winding with a full-width, single, copper, electrostatic shield arranged to minimize interwinding capacitance:

    a. Coil leads and terminal trips shall be arranged to minimize capacitive coupling between input and output connections.
    b. Shield Terminal: Separate, and marked "Shield" for grounding connection. Shield shall be connected to the reference ground point for the distribution panels.
    c. Capacitance: Limit capacitance between primary and secondary windings to a maximum of 33 picofarads over a frequency range of 20 Hz to 1 MHz.
    d. Common-Mode Noise Attenuation: 120 dB minimum, 0.5 to 1.5 kHz; minus 65 dB minimum, 1.5 to 100 kHz.
    e. Normal-Mode Noise Attenuation: 52 dB minimum, 1.5 to 10 kHz.

10. Neutral Rating: 1.732 times the system full-load ampere rating.
11. Shipping Restraints: Paint or otherwise color code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

2.5 OUTPUT PANELBOARDS

A. Description: Mount single panelboards on power distribution unit behind flush doors. Include the following features:

1. Construction: 24 pole, 240/120 V, single phase; capable of accepting branch circuit breakers rated to 60 A.
2. Panelboard Rating: 80A with main circuit breaker.

3. Panelboard Phase, Neutral, and Ground Buses: Copper, with neutral bus at least 1.732 times the nominal phase bus rating.
4. Isolated Ground Bus: Copper, adequate for branch-circuit equipment ground conductors; insulated from supports.
5. Branch Circuit Breakers: Plug on.

2.6 SOUND LEVEL

A. General: Fully assembled products comply with minimum sound-level requirements in NEMA ST 20 for transformers of corresponding ratings when factory tested according to IEEE C57.12.91.

B. Mount transformer on rubber isolation pads.

2.7 ENCLOSURE REQUIREMENTS

A. A single, freestanding, NEMA Type 3R 304 Stainless Steel enclosure. Opening of an exterior door shall not provide access to any live parts. Panels and covers that expose hazardous voltages shall require tools to remove.

B. Access from front, top, and side only for all installation, operations, and normal maintenance, including infrared scanning of bus and breakers. All normal operating controls and instrumentation shall be located on the front of the enclosure.

C. Arrange enclosure to allow lifting and moving via forklift.

2.8 SOURCE QUALITY CONTROL

A. Factory Tests: Design and routine tests shall comply with referenced standards.

B. Factory Sound-Level Tests: Conduct sound-level tests on equipment. Comply with IEEE C57.12.91 and NEMA ST 20.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Arrange power distribution units to provide adequate access to equipment and circulation of cooling air. Locate transformers away from corners and not parallel to adjacent wall surface.

B. Coordinate size and location of concrete bases with actual power distribution unit provided.

C. Equipment Mounting:

1. Install power distribution units on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

D. Identify equipment and install warning signs according to Section 260553 "Identification for Electrical Systems."

3.2 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Install flexible connections at conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification for circuit breakers, molded case; and for transformers, dry type, air cooled, low voltage. Certify compliance with test parameters.

D. Remove malfunctioning units, replace with new units, and retest as specified above.

E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

F. Power distribution unit will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Perform startup service:

1. Verify that power distribution units are installed and connected according to the Contract Documents.
2. Verify that electrical wiring installation complies with manufacturer's submittal and with written installation requirements in other electrical Sections.
3. Complete installation and startup checks according to manufacturer's written instructions.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

B. Adjust power distribution units to provide optimal voltage to equipment served throughout normal operating cycle of loads served. Record input and output voltages and adjustment settings, and incorporate into test results.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain power distribution units.

END OF SECTION 262733

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SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Nonfusible switches.

1.3 DEFINITIONS

A. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes:

1. Enclosure types and details.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers:

1. Include plans, elevations, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period:

1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches, components, and accessories, within same product category, from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by UL or a NRTL if approved by the Owner and/or Engineer, and marked for intended location and application.

C. Comply with NFPA 70.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. ABB, Electrification Products Division.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Lugs: Mechanical type, suitable for number, size, and conductor material.

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2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint or Owner approved color and paint, electrodeposited on cleaned, galvannealed steel (NEMA 250 Type 12) in "DRY" areas, NEMA 250 Type 4X 316 stainless steel in "CORROSIVE", "WET", or "DAMP" areas, or NEMA 250 Type 4X fiberglass reinforced plastic in "CORROSIVE" areas.

C. Conduit Entry: NEMA 250 Types 4X, and 12 enclosures shall contain no knockouts.

D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

E. Enclosures designated as NEMA 250 Types 12 and 4X, 316 stainless steel shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected:

1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 PREPARATION

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Owner's written permission.
4. Comply with NFPA 70E.

3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches: Provide enclosures at installed locations with the following environmental ratings:

1. Indoor, Dry and Clean Locations: NEMA 250, Type 12.
2. Outdoor Locations: NEMA 250, Type 4X 316 stainless steel.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4X, 315 stainless steel.
4. Corrosive Locations: NEMA 250, Type 4X fiberglass reinforced plastic.

3.4 INSTALLATION

A. Coordinate layout and installation of switches, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches with tops at uniform height unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Comply with NFPA 70 and NECA 1.

3.5 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

C. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that the unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter:

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

f. Verify correct phase barrier installation.
g. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:
a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.

D. Enclosed switches will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

3.7 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

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SECTION 271313 - COMMUNICATIONS COPPER BACKBONE CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Category 6 twisted pair cable.
2. Twisted pair cable hardware, including plugs, jacks, patch panels, and cross-connects.
3. Grounding provisions for twisted pair cable.
4. Cabling identification.
5. Source quality control requirements for twisted pair cable.

B. Related Requirements:

1. Section 260529 “Hangers and Supports for Electrical Systems”
2. Section 260533 “Raceways and Boxes for Electrical Systems.”
3. Section 260553 “Identification for Electrical Systems.”
4. Section 407856 “Isolators, Intrinsically Safe Barriers, and Surge Suppressors”

1.3 DEFINITIONS

A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

B. EMI: Electromagnetic interference.

C. F/FTP: Overall foil screened cable with foil screened twisted pair.

D. FTP: Shielded twisted pair.

E. F/UTP: Overall foil screened cable with unscreened twisted pair.

F. IDC: Insulation displacement connector.

G. Jack: Also commonly called an "outlet," it is the fixed, female connector.

H. LAN: Local area network.

I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.

J. RCDD: Registered Communications Distribution Designer.

K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

L. S/FTP: Overall braid screened cable with foil screened twisted pair.

M. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

N. S/UTP: Overall braid screened cable with unscreened twisted pairs.

O. UTP: Unscreened (unshielded) twisted pair.

1.4 COPPER BACKBONE CABLING DESCRIPTION

A. Copper backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. Cabling administration Drawings and printouts.
3. Wiring diagrams to show typical wiring schematics, including the following:

    a. Telecommunications rooms plans and elevations.
    b. Telecommunications pathways.
    c. Telecommunications system access points.
    d. Telecommunications grounding system
    e. Cross-connects.
    f. Patch panels.
    g. Patch cords.

4. Cross-Connects and Patch Panels: Detail mounting assemblies and show elevations and physical relationship between the installed components.

C. Twisted pair cable testing plan.

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1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Product Certificates: For each type of product.

D. Field quality-control reports.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Connecting Blocks of each type.
2. Patch-Panel Units of each type.
3. Plugs of each type.
4. Jacks of each type.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel on staff.

1. Layout Responsibility: Preparation of Shop Drawings, cabling administration Drawings, and field testing program development by a Technician.
2. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified as a Technician to supervise on-site testing.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.11 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

D. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Riser Rated: Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. RoHS compliant.

2.3 CATEGORY 6 TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.

B. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

C. Conductors: 100-ohm, 23 AWG solid copper.

D. Shielding/Screening: Screened and shielded balanced twisted pairs (F/FTP).

E. Cable Rating: Riser.

F. Jacket: Blue thermoplastic.

2.4 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. General Requirements for Cable Connecting Hardware:

1. Twisted pair cable hardware shall meet the performance requirements of Category 6.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.
4. Source Limitations: Obtain twisted pair cable hardware from same manufacturer as twisted pair cable, from single source.

C. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
3. Number of Jacks per Field: One for each four-pair twisted pair cable indicated.

D. Plugs and Plug Assemblies:

1. Male; eight position (8P8C); color-coded modular telecommunications connector designed for termination of a single four-pair 100-ohm unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.
3. Marked to indicate transmission performance.

E. Patch Cords: Factory-made, four-pair cables in 36-inch lengths; terminated with an eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.

F. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 CABLING IDENTIFICATION

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 SOURCE QUALITY CONTROL

A. Factory test cables on reels according to TIA-568-C.1.

B. Factory test cables according to TIA-568-C.2.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters. Conceal raceway and cables, except in unfinished spaces.

1. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install cables parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

A. Comply with Section 260533 "Raceways and Boxes for Electrical Systems."

B. Comply with Section 260529 "Hangers and Supports for Electrical Systems."

C. Drawings indicate general arrangement of pathways and fittings.

3.3 INSTALLATION OF COPPER BACKBONE CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:

1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2. Install 110-style IDC termination hardware unless otherwise indicated.
3. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified by the manufacturer. Use lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 10-foot- long service loop on each end of cable.
11. Pulling Cable: Comply with manufacturer recommendations. Monitor cable pull tensions.

C. Group connecting hardware for cables into separate logical fields.

D. Comply with requirements of Section 407856 “Isolators, Intrinsically Safe Barriers, and Surge Suppressors” for surge protection of cable leaving building envelope.

E. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Paint and label colors for equipment identification shall comply with TIA-606-B.

C. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.

3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

D. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Verify the distance of the cable run from end device to end device does not exceed 328ft. This distance includes patch cords, if any.
4. Test cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 271313

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SECTION 310515 - SOILS AND AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Soils: Soil materials and topsoil materials.
2. Aggregates: Coarse aggregate materials and fine aggregate materials.

B. Related Sections:

1. Section 312000 "Earthwork."
2. Section 312333 "Trenching and Backfilling"
3. Section 312500 "Erosion and Sedimentation Control."

1.3 ACTION SUBMITTALS

A. Quality Control Testing: Submit conformance testing performed by a certified independent laboratory engaged by Contractor for all fill materials. Verify maximum density, gradation, Atterberg limits, sand equivalent, and other applicable criteria at least 72 hours prior to importing or placing any fill. Perform additional conformance testing at a minimum frequency of 1 per every 2000 cubic yards or change in material.

1.4 REFERENCE STANDARDS

A. Illinois Department of Transportation (IDOT):

1. IDOT Standard Specifications (latest edition) herein referred to as the "IDOT Standard Specifications."

1.5 INFORMATIONAL SUBMITTALS

A. Materials Source: Submit name and location of imported materials suppliers.

B. Source's Certificate: Certify materials meet or exceed specified requirements.

C. Material Test Reports: For each on-site and borrow soil and aggregate material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 1557.
3. Test Reports: Submit any test reports required by this Section to the Engineer.

1.6 QUALITY ASSURANCE

A. Furnish each subsoil and top soil material from single source throughout the Work, unless an alternate source is approved by the Engineer.

B. Furnish each coarse and fine aggregate material from single source throughout the Work, unless an alternate source is approved by the Engineer.

C. Quality Control and Quality Assurance consists of laboratory conformance testing of samples supplied from each coarse and fine aggregate source and quality control during installation.

1. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.7 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
3. Contractor shall park vehicles onsite only in those areas designated on the Drawings.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Select Common Fill - Common fill shall be approved on site excavated material or imported fill material that is composed of durable soil free of debris, organic matter, or other deleterious materials. Common fill shall not contain stones larger than 2 inches in largest diameter, a maximum of 75 percent passing the No. 200 sieve, and a maximum dry density of at least 85 pounds per cubic foot (pcf) as determined by ASTM D698. Common fill shall not contain granite blocks, broken concrete, masonry rubble, or other similar materials and shall have physical properties such that it can be readily spread and compacted during filling.

B. Structural Fill – Structural fill shall consist of mineral soil free of organic material, loam, debris, frozen soil or other deleterious material which may be compressible, or which cannot be properly compacted. Structural fill should consist of materials with the following gradation:

Sieve Size	Percent Finer by Weight
3-in	100
No. 4	20 to 70
No. 40	5 to 35
No. 200	0 to 10

Structural fill should have a maximum liquid limit of 50 percent, maximum plasticity index of 10 percent, and a maximum dry density of at least 95 pcf as determined by ASTM D1557.

2.2 COARSE AGGREGATE MATERIALS

A. Aggregate used for backfill of trenches and at locations shown on the Drawings shall be CA-6 in accordance with the IDOT Standard Specifications Section 1004, and where crushed rock, and sand are identified on the drawings. Aggregate shall be used under and within 2-feet of all paved surfaces.

B. Aggregate subbase shall be coarse aggregate CA-6 in accordance with IDOT Standard Specifications Section 1004.

2.3 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing and inspection services. Submit test result reports to the Engineer.

B. Subsoil Material - Testing and Analysis: Perform in accordance with AASHTO T180.

C. Topsoil Material - Testing and Analysis: Perform in accordance with AASHTO T180 if imported from offsite sources.

D. When tests indicate materials do not meet specified requirements, change material and retest.

E. Furnish materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 EXCAVATION - SOILS

A. Excavate subsoil and topsoil from limits defined in Project Drawings. Strip topsoil to full depth of topsoil in designated areas.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

C. Excess excavated materials can be disposed of at project site in drying beds Coordinate with Owner.

D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 EXCAVATION - AGGREGATES

A. Coordinate excavation of aggregate materials from on-site locations as specified in Section 312000 "Earthwork."

B. Remove excavated materials from site.

3.3 STOCKPILING

A. Stockpile spoils and other materials at least 2 feet from trench and excavation edges.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different soil and aggregate materials with dividers or stockpile individually to prevent mixing. Prevent intermixing of soil types or contamination.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.4 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition.

B. Leave unused materials in neat, compact stockpile.

END OF SECTION 310515

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SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Removing above- and below-grade site improvements.
   2. Disconnecting, capping or sealing, and removing site utilities.
   3. Temporary erosion and sedimentation control.

B. Related Requirements:

   1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.
   2. Section 312500 “Erosion and Sedimentation Controls” for temporary protection of erosion and sedimentation.

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

1.4 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining paved surfaces, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct adjoining paved surfaces, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructions if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Engineer.

C. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

D. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earthwork."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

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PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

C. Call Local Utility Line Information service not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to the Drawings, Section 312500, and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

A. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Engineer's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

3.4 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.5 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other project work.

END OF SECTION 311000

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SECTION 312000 – EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. General: Earthwork includes clearing and stripping, procurement of on-site and imported fill material, excavating, placing, and compacting fill and backfill, structural excavating and backfilling, transportation and storage of excess earthwork materials; disposal of unsuitable, waste, and surplus materials; restoration of excavation and trench surfaces; and subsidiary work necessary to complete the grading of developed areas to conform with required lines, grades, and slopes.

B. Work includes but is not necessarily limited to; excavation for below-grade utilities and structures, foundations, electrical conduits and structures, cables, raceways and ducts, pipes, paving; embankments; grading; and related work such as sheeting, bracing and dewatering.

C. Provide services of a licensed Professional Engineer to prepare temporary excavation support system, dewatering system designs, and submittals.

D. Provide temporary excavation support systems, including sheeting, shoring, and bracing, to ensure the safety of personnel and protect adjacent structures, piping, and other materials in accordance with Federal, State and local laws, regulations, and requirements. Temporary excavation support systems are specified in Section 315000 "Excavation Support and Protection."

E. Provide temporary dewatering, surface water control systems, and operate to dewater and maintain excavations in a dry condition. Control drainage into excavations and remove seepage water and rainwater.

F. Examine site and review available geotechnical report prior to submitting a proposal, taking into consideration project conditions that may affect the work. Owner and Design Engineer do not assume responsibility for variations of subsurface conditions at locations other than places shown and at the time investigations were made.

G. Do not initiate extra work without written notification to Owner and Engineer and receiving Owner's written approval in response.

H. Protect existing structures and utilities that remain.

I. Related Requirements:

1. Section 013200 "Construction Progress Documentation" Section 013233 "Photographic Documentation" for recording pre-excavation and earthwork progress.
2. Section 310515 “Soils and Aggregates for Earthwork” for fill materials.
3. Section 311000 "Site Clearing" for site preparation work, including stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
4. Section 312333 “Trenching and Backfilling” for stated work.
5. Section 312500 “Erosion and Sedimentation Controls” for temporary stated work.
6. Section 315000 "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

C. Coverage: Pass of compaction equipment over the complete surface area of exposed lift or subgrade to receive compaction.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Additional Excavation: Excavation as directed by Engineer to correct Contractor’s work not in compliance with Contract Documents, which will be performed without additional compensation.
3. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
4. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be provided without additional compensation.

E. Finished Grade: Required final grade elevation indicated on Drawings. Spot elevations take precedent over proposed contours.

F. In-the-Dry: An excavation subgrade where groundwater level: has been lowered to at least 2 feet below lowest level of excavation; is stable with no ponded water, mud, or muck; is able to support construction equipment without rutting or disturbance; and is suitable for placement and compaction of fill material, pipe, or concrete foundations.

G. Objectionable Material: Includes topsoil, organic matter, contaminated soil, construction debris, perishable materials, snow, ice, frozen earth, and rocks or lumps of cemented soils over 6 inchesin maximum dimension.

H. Optimum Moisture Content: Moisture content (percent by dry weight) corresponding to maximum dry density of the same material as determined by ASTM Test Method D 1557.

I. Over excavation: Removal of unsuitable soil or objectionable material at or below the normal grade of excavation or subgrade as indicated on Drawings.

J. Percent Compaction: Required in-place dry density of the material, expressed as a percentage of the maximum dry density of the same material, as determined in the laboratory by ASTM Test Method D 1557.

K. Stockpile: A supply of soil and materials stored for future use, usually accrued and maintained.

L. Structures: Buildings, wet wells, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, manholes and vaults, or other man-made stationary features constructed above or below the ground surface.

M. Subgrade: Required surface of subsoil, borrow fill, or compacted fill that is immediately beneath site improvements, especially dimensioned fill, paving, or other surfacing material.

N. Test Pit: Also referred to as "pot-holing" or "windowing," test-pitting is herein defined as a "test" excavation performed to locate and verify existing utilities below grade, study/sample soils, verify groundwater table, etc. All test-pitting activities to be completed in a safe manner with no damage to underground utilities.

O. Unsuitable Soil: Includes existing fill materials, organic soils, weak native soils, or clays with a plasticity index of greater than 30, and any materials that cannot be properly placed and compacted as specified.

P. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

Q. Zone of Influence: A line extending at least 2 feet beyond foundation or pipeline edge, then outward and downward at a slope of 1 horizontal to 1 vertical. Do no excavation below foundation of existing structures or pipeline.

R. Professional Engineer: Registered Professional Engineer in the State of Illinois, meeting project qualifications and who is hired by Contractor.

S. The Engineer: Owner designated representative.

1. Approval given by the Engineer shall not relieve Contractor of its responsibilities for performing the work in accordance with Contract Document requirements.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct pre-excavation conference at Project site.

1. Review methods and procedures related to earthmoving, including, but not limited to, the following:

a. Personnel and equipment needed to make progress and avoid delays.
b. Coordination of Work with utility locator service.
c. Extent of trenching by hand or with air spade.
d. Field quality control.
e. Dewatering techniques (if required)

1.5 ACTION SUBMITTALS

A. Construction & Operations Plan: Submit a comprehensive plan for all excavation and earthwork activity involving removal and installation of work. Of highest importance is excavation within the zone of influence of existing structures and pipelines:

1. Test-pitting procedures and locations when required by the Contractor
2. Excavation site plan
3. Excavation support means and methods
4. Soil stockpiling locations
5. Truck routes
6. Dewatering
7. OSHA compliance notes
8. Health & Safety Plan
9. Any other pertinent information to verify safe and proper procedures to be reviewed and approved by Engineer.

B. Site Characterization Data: Submit following information regarding off-site source and material:

1. Site location.
2. Present and past usage of the source site and material.
3. Previously existing reports associated with an assessment of source site relating to presence of oil or other hazardous materials.
4. Location within the site from which the material will be obtained.

C. Submit laboratory test results for fill materials that include maximum density, gradation, Atterberg limits, sand equivalent, and other applicable criteria, at least 72 hours prior to importing or placing fill.

D. Prepare excavation support system designs by a licensed Professional Engineer, registered in the State of Illinois, and having a minimum of 5 years of professional experience in design and construction of excavation support systems.

1. Submit a copy of the licensed Professional Engineer's certification, on PE form specified in Section 013300, stating excavation support systems designs have been prepared by Professional Engineer who is responsible for their execution.

1.6 INFORMATIONAL SUBMITTALS

A. Construction and Operations Plan: Submit proposed methods of construction, including earthwork operations, excavation limits, slopes, fill material moisture conditioning and

handling, compaction equipment, excavation support systems designs, backfilling and filling and compaction, stockpile locations, and material sources.

1. Submit excavation support system plan as prepared by registered Professional Engineer complying with requirements stated in previous Article.

B. Submit copies of field daily reports by soil technician at the end of each work day that earthwork and grading operations occur.

C. Upon completion of earthwork and grading operations, submit an as-graded map showing density test numbers and locations, a table of density test results and depths, and a certification of compliance by geotechnical engineer in charge.

D. Qualification Data: For qualified testing agency to conduct geotechnical observation, testing and documentation. include qualifications of firm, resumes of soil technicians assigned to the project, and licensed geotechnical engineer in charge.

1. Firm Qualifications: Meet ASTM D 3740.
2. Soil Technicians: Have minimum three years demonstrated experience in earthwork and grading operations and satisfy certification requirements of agency having local jurisdiction.

    a. The Engineer reserves right to request substitution of soil technicians assigned to field work. Do not substitute assigned soil technicians without prior approval of the Engineer.

E. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.7 QUALITY ASSURANCE

A. Excavation, trenching, sheeting, bracing, and similar work shall comply with requirements of OSHA excavation safety standards, 29 CFR Part 1926 Subpart P and State and local authorities having jurisdiction. Where conflict between OSHA, State and local regulations exists, apply most stringent requirements.

B. At least three working days prior to starting any excavation, notify DIGGER by dialing 811 the appropriate regional notification center for underground utilities and underground utility owners who are not members of notification center.

C. Quality Control Testing for Off-site Borrow Materials:

1. Chemical testing will not be required where site characterization of off-site borrow sources indicates that soils are acceptable for use. If site characterization data or materials are suspected of being contaminated, perform chemical testing as directed by The Engineer with no additional compensation.
2. Chemical Test Data: Test each material source requiring testing by a person experienced in sample collection who is a registered Professional Engineer or geologist, or certified groundwater or environmental professional registered in the State of Illinois. Submit

samples of each proposed material to a chemical analytical laboratory, certified by the governing agency, for following analyses:

a. Volatile Organic Compounds: EPA 8240 plus Hazardous Substance List (HSL) Parameters.
b. Acid and Base Neutral Extractable Organic Compounds: EPA 8270.
c. Pesticides and PCBs: EPA 8080.
d. Total Petroleum Hydrocarbons: Infrared Method, EPA 9071/418.1.
e. Thirteen Priority Pollutant Metals: EPA 7000 Series.
f. Total Cyanide: EPA 9012.

3. Obtain and test off-site borrow samples in accordance with criteria established by the Engineer. Submit results for review and approval prior to use on site.

1.8 FIELD CONDITIONS

A. Be responsible for construction layout and reference staking necessary for proper control and satisfactory completion of structures, cutting, filling, grading, drainage, fencing, embankment improvements, curbing, and other appurtenances.

B. Perform construction layout and staking by a Professional Surveyor or Professional Engineer registered in State of Illinois where project occurs, experienced and skilled in construction layout and staking requirements.

C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earthwork operations.

D. Do not commence earthwork operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015000 "Temporary Facilities and Controls" and Section 311000 "Site Clearing" are in place.

E. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material at locations other than as shown on the Drawings or approved by the Engineer.
2. Parking vehicles or equipment outside of areas shown on the Drawings or approved by the Engineer.
3. Foot traffic in areas outside of work zones or the Project Limits.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

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PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Fill materials designated for use in this Section are specified in Section 310515 "Soils and Aggregates for Earthwork."

B. On-Site Fill Material: Earth and rock material obtained at project site during excavation, following clearing and stripping, from which any Unsuitable Soil or Objectionable Material has been removed.

C. General: Provide imported fill materials when sufficient satisfactory soil materials are not available from excavations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, sidewalks, pavements, fencing, landscaping, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

1. If necessary, remove and restore or replace curbing, driveway aprons, and fencing after performing backfilling work.
2. Replace existing facilities damaged by construction with new material fully equal to existing without additional compensation.

B. Prior to and During Earthwork Operations:

1. Assess, monitor, and maintain stable geotechnical conditions per approved submittals and procedures.
2. Protect and maintain erosion and sedimentation controls; coordinate with Section 312500 "Erosion and Sedimentation Controls."
3. Provide, monitor, and maintain excavation support; coordinate with Section 315000 "Excavation Support and Protection."

    a. Use excavation support system for excavations within the zone of influence for existing structures or utilities.
    b. Do not permit excavations below base level of adjacent foundations or retaining walls, unless excavation design and bracing includes an analysis of structure's stability supported by the foundation. When necessary due to project conditions, incorporate required bracing and foundation underpinning.

4. Provide, monitor, and maintain dewatering and drainage systems if deemed necessary.

C. Test Pits:

1. Perform exploratory excavation work, test pits, for purpose of verifying the location of underground utilities and structures and to check for unknown utilities and structures, prior to commencing excavation work.
2. Backfill and compact test pits as soon as desired information has been obtained. Stabilize backfilled surfaces in accordance with approved erosion and sedimentation control plans.

D. Clearing and Stripping. Initially clear and strip ground surfaces beneath planned structures and in areas requiring excavation or filling of organic material and debris. Do not use those materials containing organic material and debris as On-Site Fill Material..

E. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

F. Saw cut existing pavement with a saw, wheel, or pneumatic chisel along straight lines before excavating.

3.2 DEWATERING AND DRAINAGE

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff and groundwater seepage away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

C. Accomplish dewatering by methods that preserve undisturbed state of subgrade soils. Dewater in a manner to prevent boiling, detrimental under-seepage, or disturbance at excavation base.

3.3 SUPPORT OF EXCAVATION

A. Provide excavation support in accordance with Section 315000 “Excavation Support”. This Article supplements those requirements.

B. Install excavation support in accordance with reviewed Shop Drawings prior to beginning excavation work. Maintain excavation supports that are required to remain in place, if applicable, as indicated on Drawings or as required by approved Shop Drawings.

C. All excavation supports shall be removed at the completion of the Work.

D. Carefully remove excavation supports in a manner without endangering the Work or other adjacent structures, utilities, or property. Immediately fill voids left or caused by withdrawal of supports with sand and compact.

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3.4 EXCAVATION

A. Include material of every description and of whatever substance encountered as an unclassified excavation.

B. General: Excavate on-site soils using standard earthmoving equipment. Excavation in dense soil or rock may require special equipment. Do not plough, scrape, or dig earth with machinery so near to finished subgrade to result in excavation of or disturbance of below grade material.

C. Make excavations to grades indicated on Drawings and in widths sufficient for laying of utilities, construction of the structure, installing bracing, excavation supports, dewatering and drainage facilities, and working clearances.

D. Perform excavation in-the-dry and accomplished by methods which preserve the natural undisturbed condition of subgrade soils.

E. Moisture Sensitive Soils: Use a smooth-edge bucket to excavate last one foot of depth when excavation is to end in such soils.

F. If excavation bottom is removed below the limits shown on Drawings, specified, or directed by the Engineer, refill with structural fill or other material satisfactory to the Engineer without additional compensation.

G. When excavation has reached prescribed depths, notify the Engineer who will observe the conditions. If materials and conditions are not satisfactory, the Engineer will issue instructions for corrective procedures. The Engineer will be the sole judge as to whether the work has been accomplished satisfactorily.

H. Subgrade soils that have become soft, loose, quick, or otherwise unsatisfactory due to inadequate excavation, dewatering, or other construction methods in the opinion of the Engineer, remove existing soil and replaced with structural fill or other material as acceptable to the Engineer at Contractor's expense.

I. Perform over-excavation at the Engineer's request to remove unsuitable soil, objectionable material, or other materials as determined by the Engineer and to such depth and width as directed. Replace with suitable material as directed by the Engineer.

   1. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

J. Perform excavation for utilities beneath structures and excavation for footings with excavating equipment operating from the subgrade for the structure, while in-the-dry and in a manner preserving the undisturbed state of subgrade soils.

K. When excavations have reached the required subgrade, including any allowances for working mats or base materials and prior to their placement, notify soils testing laboratory to verify suitability of existing subgrade soils for anticipated foundation and structural loadings.

   1. If existing subgrade soils are determined to be unsuitable, follow direction provided by the Engineer regarding removal and replacement with suitable materials.

2. Notify the Engineer if the revised work scope would modify Contractor's cost and thereby entitle a change to the Contract Sum. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

L. Replace over-excavation beyond the limits and depths required by Contract Documents using structural fill or other material satisfactory to the Engineer without additional compensation.

3.5 SUBGRADE PREPARATION

A. Notify Engineer when excavations have reached required subgrade.

B. Maintain excavated subgrade in-the-dry condition.

C. Prior to fill placement, remove objectionable material which includes, but not be limited to, pavement, topsoil, organic matter, contaminated soil, construction debris, perishable materials, snow, ice, frozen earth, and rocks or lumps of cemented soils over 6 inches in maximum dimension.

D. For subgrades consisting of granular soils, proof roll the final subgrade using at least four coverages of a vibrator plate compactor.

E. Where existing subgrade contains a significant amount of clay or cohesive soils, over-excavate sufficiently below the bottom of structure for placement of a lean concrete working mat. Remove loose or soft material from the subgrade immediately prior to placing lean concrete working mat.

F. Remove and replace soft subgrades or unusable material with structural fill or other material satisfactory to the.

G. During wet or freezing weather, or in areas where exposed subgrade consists of moisture-sensitive soils, take measures to protect foundation excavations once they have been approved by the Engineer. Protective measures include, but are not limited to, placing insulation blankets, placing a layer of fill, pea gravel, crushed rock, or lean concrete on the exposed subgrade, or covering the exposed subgrade with a plastic tent.

1. If additional over-excavation is required due to the subgrade not being protected against wet or freezing weather, perform additional work without additional compensation.

H. Notify the Engineer to observe conditions following subgrade preparation and prior to fill placement. If existing subgrade soils are determined to be unsuitable, follow direction provided by the Engineer regarding removal and replacement with suitable materials.

1. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

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3.6 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust. Protect from precipitation.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of existing trees. Stockpile material at locations shown on the Drawings or agreed to by the Engineer.

3.7 FILL PLACEMENT AND COMPACTION PROCEDURES

A. Fill and Backfill: Place materials in lifts to suit specified compaction requirements to required lines and grades, making allowances for settlement and placement of cover materials, such as topsoil or sod. Correct soft spots or uncompacted areas.

B. Do not place or compact fill and backfill when materials are too wet to properly compact.

1. In-place Soil Moisture Content: Maximum of three percentage points above optimum moisture content of soil, as determined by laboratory test of moisture-density relation appropriate to specified level of compaction. Contractor shall pay for all required tests.

C. Structural Fill and Embankment Fill: Construct to required lines and grades, making allowances for settlement and placement of cover materials, such as topsoil and sod. Correct soft spots or uncompacted areas.

D. Fill material shall be free of snow, ice, frost, and frozen earth. Do not place fill materials on frozen surfaces or surfaces covered by snow, ice, or frost.

E. Complete structure water-tightness tests and installation of dampproofing or waterproofing systems prior to placing various types of fill or backfill around structures.

F. If subgrade slopes more than 10 percent, step subgrade to produce a stable, horizontal surface for placement of fill materials. Scarify existing subgrade slope to a depth of at least 6 inches.

G. Compact filled slopes by slope rolling and trimming, or overfill and trim back to plan grade to expose a firm, smooth surface free of loose material.

H. Do not allow fill lifts to contain stones with a dimension larger than 2/3 the specified loose measure lift thickness.

I. Perform compaction in open areas using compaction equipment by any of the following methods:

1. Fully loaded ten-wheel trucks or front-end loaders.
2. Tractor dozers weighing minimum of 30,000 pounds.
3. Heavy vibratory rollers.

J. Confined Compaction: Perform compaction in confined areas, including areas within a 45-degree angle extending upward and outward from the base of a wall, and in areas where the use

of large equipment is impractical, using hand-operated vibratory equipment or mechanical tampers.

1. Do not exceed lift thickness of 6 inches, measured before compaction, when using hand operated equipment.

K. Moisture condition on-site fill material prior to placement, unless Contractor demonstrates to the Engineer in-place moisture conditioning methods can achieve the required moisture content.

L. Conduct compaction of each specified lift of fill materials by a minimum of four complete coverages with acceptable compaction equipment to a specified density as a percentage of maximum dry density as determined by ASTM D 1557, unless otherwise specified.

M. Use structural fill required beneath foundations or slabs on grade, except sidewalks. Place and compact structural fill in even lifts having a maximum thickness of 8 inches, measured before compaction.

N. Use select fill and backfill material placed within 5 feet of all structures. Uniformly place and compact select fill around the structure in even lifts having a maximum thickness of 8 inches, measured before compaction.

O. Use common fill in areas beyond those designated for structural fill or select fill, unless shown or otherwise specified. Place in even lifts having a maximum thickness of 12 inches, measured before compaction.

P. Place impervious fill in controlled, even lifts having a maximum thickness (measured before compaction) of 6 inches.

1. Permeability: Compact to attain a reading of less than 1×10^{-7} cm/sec.
2. Moisture Content: Compact to optimum moisture content of minus 2 percent to plus 3 percent.

3.8 COMPACTION REQUIREMENTS

A. Perform in-place testing of compacted fill lifts to measure in-place density and water content according to ASTM D 1557.

B. Area Around Structures: Within 5 feet compact each fill or backfill layer to:

1. Maximum Dry Density: Minimum of 92 percent for ASTM D 1557.
2. Moisture Content: At or near its optimum moisture content of minus 2 percent to plus 3 percent.

C. Embankments, Lawn, or Unimproved Areas: Does not include embankments under roadways and earth dam structures. Compact each fill or backfill layer to:

1. Maximum Dry Density: Minimum of 90 percent for ASTM D 1557.
2. Moisture Content: At or near its optimum moisture content of minus 1 percent to plus 4 percent.

D. Sidewalks: Compact each fill layer to:

1. Maximum Dry Density: Minimum of 92 percent for ASTM D 1557.
2. Moisture Content: At or near its optimum moisture content of minus 2 percent to plus 3 percent.

E. Roads, Paved Areas, and Roadway Embankments: Compact each layer of fill or backfill to:

1. Maximum Dry Density: Minimum of 95 percent for ASTM D 1557.
2. Moisture Content: At or near its optimum moisture content of minus 2 percent to plus 3 percent.

3.9 DISPOSAL OF UNSUITABLE, WASTE, AND SURPLUS EXCAVATED MATERIALS

A. Unsuitable soil, objectionable material, waste, and surplus excavated material shall be removed and disposed of off-site.

3.10 GRADING

A. Perform grading to lines and grades shown on Drawings and/or to restore drainage to existing surfaces adjacent to the Work. Remove objectionable materials encountered within the limits indicated and disposed of off-site. Completely and continuously drained and dewatered subgrades throughout the grading process. Install temporary drains and drainage ditches to intercept or divert surface water that may affect the execution or condition of grading work.

B. If it is not possible at the time of grading to place material in its proper section of the Work, stockpile it in approved areas for later use. No additional compensation will be made for stockpiling or double handling of excavated materials.

C. In cut areas, remove loose or protruding rocks in slopes to line or finished grade of the slope. Uniformly dress, cut, and fill slopes to slope cross-section and alignment shown on Drawings, unless otherwise directed by the Engineer.

3.11 FIELD QUALITY CONTROL

A. Test and observe materials as described in this Article. Contractor field testing subcontractor shall perform all material tests and observations.

B. General Testing Requirements:

1. Backfill and Fill: Prior to and during the placement of backfill and fill coordinate with Contractor's Soils Certified Independent Testing Laboratory to perform in-place soil density tests to verify that backfill and fill material has been placed and compacted in accordance with specified compaction requirements.

    a. Provide minimum 48 hours' notice prior to placement of backfill and fill.

2. Subgrade: Do not cover with fill without observation, testing, and approval by Contractor's Soils Certified Independent Testing Laboratory.

    a. Earthwork activities performed without properly scheduled inspection are subject to removal and replacement or additional testing fully paid for by the Contractor and as directed by the Engineer.

C. Test materials by a certified independent laboratory, engaged by Contractor and acceptable to the Engineer, demonstrating conformance with project requirements. Deliver test reports and material certifications to the Engineer before using any material in the work.

D. If field test results are not in conformance with project requirements, costs involved in correcting deficiencies in compacted materials to satisfaction of the Engineer without additional compensation.

E. Earthwork activities performed without properly scheduled inspection are subject to removal and replacement or additional testing as directed by the Engineer without additional compensation.

F. Testing methods shall comply with latest ASTM or equivalent AASHTO Standards applicable during bidding.

G. During placement of bedding, backfill, and fill, perform in-place soil density testing to confirm that fill material has been compacted in accordance with project requirements. The Engineer may designate areas to be tested. Notify the Engineer at least 72 hours in advance of scheduled compaction testing. In place soil density tests on backfill and fill material shall be as required by authorities having jurisdiction, project geotechnical report, but in no instance, shall less than those listed:

1. Structures and Embankments: At least one density and moisture content test for each 2,500 square feet of surface area for each lift of fill at embankment, structure, and manhole locations.
2. Trench Excavations: At least one nuclear density and one moisture content test at a maximum of 30 feet intervals for each lift of fill placed or as directed by the Engineer.
3. The Engineer may designate supplemental areas to be tested at additional compensation.

H. Materials which have been previously tested may be subjected to further testing from time to time and may be rejected, if it is determined that results do not conform to project requirements. Immediately remove rejected materials when directed by the Engineer, notwithstanding results of previous testing.

I. The Engineer or Owner may conduct additional soil testing. Cooperate fully in allowing additional test to be made, including free access to the work.

3.12 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by the Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

END OF SECTION 312000

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SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes temporary construction dewatering and surface water control and incorporates the design, equipment, materials, installation, operation, protection, monitoring and removal of dewatering and drainage system. Provide dewatering system sufficient to lower groundwater and collect surface water, regardless of groundwater level or rainfall at any time during the work.

B. Obtain and pay for permits required for dewatering and drainage systems. Implement measurements to comply with dewatering and discharge permits requirements.

C. Related Requirements:

1. Section 013233 "Photographic Documentation" for recording preexisting conditions and dewatering system progress.
2. Section 310515 “Soils and Aggregates for Earthwork” for filter sand.
3. Section 312000 "Earthwork" for excavating, backfilling.
4. Section 312333 “Trenching and Backfilling” for trenching, backfilling, and compaction.
5. Section 312500 “Erosion and Sedimentation Controls” for controlling surface-water runoff and ponding.
6. Section 315000 “Excavation Support and Protection” for support of excavations.

1.3 DEFINITIONS

A. In-the-Dry: An excavation subgrade where all of the following are met:

1. Groundwater level has been lowered to at least 2 feet below lowest excavation level.
2. Subgrade is stable with no ponded water, mud, or muck.
3. Subgrade is able to support construction equipment without rutting or disturbance.
4. Subgrade is suitable for placement and compaction of fill material, pipe, or concrete foundations.

B. Contractor’s Engineered Design: Design prepared on behalf of Contractor by a registered Professional Engineer.

C. Professional Engineer: Registered Professional Engineer in the State of Illinois meeting project qualifications and who is hired by Contractor.

D. The Engineer: Representative designated by the Owner.

1. Approvals given by The Engineer shall not relieve Contractor of its responsibilities for performing the work in accordance with Contract Document requirements.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Verify availability of Installer's personnel, equipment, and facilities needed to perform the work, make progress and avoid delays.
2. Review condition of site to be dewatered including coordination with temporary erosion-control measures, excavation support systems, and temporary controls and protections.
3. Review proposed site clearing and excavations.
4. Review existing utilities and subsurface conditions.
5. Review observation and monitoring of dewatering system.
6. Review sampling and testing requirements for discharge.
7. Review pretreatment requirements prior to discharge, discharge location(s), and flow rate requirements.

1.5 ACTION SUBMITTALS

A. Design Plan: Submit written dewatering and drainage system design plan, prepared by a qualified Professional Engineer, that includes:

1. Description of proposed dewatering system and installation methods to be used for system elements and observation wells.
2. Description of equipment, drilling methods, holes sizes, filter sand placement techniques, sealing materials, development techniques, number and location of dewatering points and observations wells.
3. Dewatering system design calculations demonstrating that the proposed system meets all requirements herein and elsewhere.
4. Sequence of well and well-point placement coordinated with support of excavation system installation and control procedures to be adopted, if dewatering problems arise.
5. Identification of anticipated area influenced by dewatering system and address impacts to adjacent existing and proposed structures.
6. Coordinate dewatering and drainage submittals with excavation and support of excavation submittals.

B. Shop Drawings: For dewatering system, prepared by a qualified Professional Engineer.

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
3. Include pump capacity and anticipated discharge rate.
4. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.

5. Show areas and depths of excavation to be dewatered and adjacent structures or facilities within the anticipated area influence.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

C. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in dewatering work and having a minimum of 5 years' experience.

B. Professional Engineer Qualifications: Licensed Professional Engineer registered in the State where project is located; having a minimum of 5 years' experience in design and construction of dewatering and drainage systems; and having completed not less than 5 successful dewatering and drainage projects of equal type, size, and complexity to that required for the work.

C. Comply with authorities having jurisdiction for the following:

1. Drilling and abandoning of wells used for dewatering systems.
2. Water discharge and disposal from dewatering operations.

D. Obtain permit from EPA under National Pollutant Discharge Elimination System (NPDES), for storm water discharge from construction sites.

1.8 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or Professional Engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of surface and ground water and permit excavation and construction to proceed in-the-dry in accordance with the requirements herein and elsewhere.

1. Design dewatering system, including comprehensive engineering analysis by a the Contractor's Design Engineer.
2. Continuously monitor and maintain dewatering operations to ensure required groundwater lowering, erosion control, stability of excavations, excavation support, and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

B. Primary Purpose of Work: Preserve natural undisturbed condition of subgrade soils in areas of proposed excavations.

1. Prior to excavation, lower groundwater to at least 2 feetbelow lowest excavation subgrade elevation.
2. Additional groundwater lowering may be necessary beyond 2 feet requirement, depending on construction methods, equipment used, and prevailing groundwater and soil conditions. Lower groundwater as necessary to complete construction in accordance with Contract Documents without additional compensation

C. Design deep wells, well points and sumps, and other groundwater control system components to prevent loss of fines from surrounding soils. Use sand filters with dewatering installations, unless screens are properly sized by Contractor's design engineer to prevent passage of fines from surrounding soils.

D. Maintain standby pumping systems and sources of standby power at various sites.

E. Design dewatering system to prevent damage to adjacent properties, buildings, structures, utilities, and facilities from dewatering operations. Be responsible for damage to properties, buildings or structures, sewers and other utility installations, pavements, and work that may result from dewatering or surface water control operations.

F. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

2.2 MATERIALS

A. Equipment: Piping, pumping, and other equipment and materials to provide control of surface water and groundwater in excavations.

PART 3 - EXECUTION

3.1 GENERAL

A. Control surface water and groundwater such that:

1. Excavation to final grade is made in-the-dry.
2. Natural undisturbed conditions of subgrade soils are maintained.
3. Softening, instability, or disturbance due to presence or seepage of water does not occur.
4. Construction and backfilling proceeds in-the-dry.
5. Floatation of completed portions of work shall be prohibited.

B. Methods of groundwater control may include but are not limited to trenches and sump pumping.

C. Where groundwater levels are above proposed bottom of excavation level, provide a pumped dewatering system for pre-drainage of soils prior to excavation and for maintaining lowered groundwater level until construction has been completed such that structure, pipeline, or fill will not be floated or otherwise damaged.

D. Vary type of system, spacing of dewatering units, and other details of the work depending on soil and water conditions at each location.

E. Do work in a manner to protect adjacent structures and utilities without causing loss of ground or disturbance to pipe bearing soils or soils supporting overlying or adjacent structures.

F. Locate groundwater control system components where they will not interfere with construction activities adjacent to the work area or interfere with installation and monitoring of geotechnical instrumentation including observation wells. Do not make excavations for sumps or drainage ditches within or below 1H:1V slopes extending downward and out from edges of existing or proposed foundation elements or from downward vertical footprint of pipe without approval by the Engineer.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways, if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 015000 "Temporary Facilities and Controls," during dewatering operations.

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3.3 INSTALLATION

A. Install dewatering system utilizing pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
   1. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.4 SURFACE WATER CONTROL

A. Construct surface water control measures, including dikes, ditches, sumps and other methods to prevent flow of surface water into excavations and to allow construction to proceed without delay.

B. Grade excavation to divert surface water and seepage water within excavation areas into sumps and dewatering wells.

3.5 EXCAVATION DEWATERING

A. Provide and maintain equipment and facilities to promptly remove and properly dispose of water entering excavations. Maintain excavations in-the-dry.

B. Excavation dewatering shall maintain the subgrade in a natural undisturbed condition and be in operation until the fill, structure or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.

C. Do not place pipe, masonry, and concrete in water or submerge within 24 hours after being installed. Prevent water from flow over new masonry or concrete within four days after placement.

D. Prevent water from rising to cause unbalanced pressure on structures until concrete or mortar has set at least 24 hours. Prevent pipe flotation by promptly placing backfill.

E. Conduct dewatering to preserve natural undisturbed condition of subgrade soils at bottom of excavation.

F. If trench subgrade or excavation bottom becomes disturbed due to inadequate dewatering or drainage, excavate below normal grade as directed by the Engineer and refill with structural fill, screened gravel, or other material as approved by the Engineer without additional compensation.

G. It is expected that initial dewatering plan may be modified to suit variable soil and water conditions encountered. Dewater and excavate in a manner without causing loss of ground or disturbance to pipe bearing soil or soil that supports overlying or adjacent structures.

H. If methods do not properly dewater excavation, install groundwater observation wells as directed by the Engineer. Do not place pipe or structure until readings obtained from observation wells indicate that groundwater has been lowered to specified minimum of below bottom of final excavation.

I. Pump continuously from dewatering system until pipe or structure is adequately backfilled. Provide stand-by pumps.

J. Collect water entering excavations from precipitation or surface runoff in shallow ditches around excavation perimeter, drained to a sump, and pump from excavation to maintain a bottom free from standing water.

K. Dispose of drainage to an approved area designated by Owner.

3.6 REMOVAL OF SYSTEMS

A. At completion of excavation and backfilling work and when approved by the Engineer, remove from site various pumps, generators, observation wells, other equipment, and accessories used for groundwater and surface water control systems.

1. Removed materials and equipment become property of Contractor.

B. Restore areas disturbed by installation and removal of groundwater control systems and observation wells to their original condition.

END OF SECTION 312319

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SECTION 312500 - EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Filter Bags
2. Inlet protection

B. Related Sections:

1. Section 310515 "Soils and Aggregates for Earthwork"
2. Section 311000 "Site Clearing"

1.3 REFERENCE STANDARD

A. EPA document titled: "Stormwater Management for Construction Activities – Developing Pollution Prevention Plans and Best Management Practices" document number EPA 832-R-92-005, dated 1992, or most recent edition. State or appropriate Conservation Commission standards can be substituted for the EPA standard if the State or Conservation Commission standard is equal to, or more detailed than, the EPA standard.

1.4 ACTION SUBMITTALS

A. Contractor shall submit all documents, drawings, submittals, and required information to the Engineer prior to start of construction work.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.

1.6 CLOSEOUT SUBMITTALS

A. Section 017700 "Closeout Procedures": Requirements for submittals.

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1.7 QUALITY ASSURANCE

A. Perform Work according to State and local standards.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.

PART 2 - PRODUCTS

2.1 FILTER BAGS

A. Filter Bags: Sized with manufacturer recommendations based on pumped discharge rate.

B. Geotextile Material for Bags: Meet the following minimum requirements:

Minimum Grab Tensile Strength	200 lbs
Minimum Grab Tensile Elongation	50%
Minimum Trapezoidal Tear Strength	80 lbs
Mullen Burst Strength	380 psi
Minimum Puncture Strength	130 lbs
Apparent Opening Size	40-80 US Sieve
Minimum Flow Through	70 gpm/square foot

C. Bag shall have opening large enough to accommodate 4 inch diameter discharge hose.

2.2 INLET PROTECTION

A. Inlet protection shall be Dandy Curb Bag by Dandy Products, P.O. Box 1680, Powell, OH 43065, T: 1-800-591-2284 or approved equal. Straw bales or silt fence fabric material shall not be approved equals for inlet protection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017300 - Execution: Verification of existing conditions before starting work.

B. Verify compacted subgrade and stabilized soil is acceptable and ready to support devices and imposed loads.

C. Verify gradients and elevations of base or foundation for other work are correct.

D. Install erosion and sediment control devices at the locations shown on the Drawings prior to starting any construction activities.

3.2 FILTER BAG

A. Install and utilize filter bags Filter bags for discharge of dewatering water to any inlet or other below grade structure, or when directed by the Engineer or Owner.

B. Install bag on a 2 inch (50 mm) gravel bed or on pavement to allow water to flow in all directions.

C. Bag is full when remaining flow area is reduced by 75%. Replace full bags with new bags.

3.3 INLET PROTECTION

A. Install inlet protection devices to any inlets located in the vicinity of the Work, or as directed by the Engineer. Install in accordance with the manufacturer's written instructions.

3.4 SITE STABILIZATION

A. Incorporate erosion control devices into the Project at the earliest practicable time, or as directed by the Engineer.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 10 feet. Slope stockpile sides at 2:1 or flatter.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 14 days.

3.5 FIELD QUALITY CONTROL

A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

3.6 CLEANING

A. Section 017300 "Execution" and 017700 "Closeout Procedures": Requirements for cleaning.

B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

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3.7 PROTECTION

A. Section 017300 “Execution”: Requirements for protecting finished Work.

END OF SECTION 312500

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SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes temporary excavation and trench support and protection systems.

B. Related Requirements:

1. Section 013233 "Photographic Documentation" for recording preexisting conditions and excavation support and protection system progress.
2. Section 014000 “Quality Requirements” for testing and laboratory services.
3. Section 312000 "Earthwork" for excavating and backfilling.
4. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference:

1. Review existing utilities and subsurface conditions.
2. Review coordination for interruption, shutoff, capping, and continuation of utility services.
3. Review proposed excavations.
4. Review proposed equipment.
5. Review monitoring of excavation support and protection system.
6. Review coordination with waterproofing.
7. Review abandonment or removal of excavation support and protection system.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer, meeting the minimum performance requirements in Part 2 of this Section.

1. Include overall system plan, indicating clearances, dimensions, material properties, member sizes, locations, spacing and member penetrations depths, and locations of various types of lateral supports.

2. Show details, layout, arrangement, equipment requirements, and method of construction of proposed excavation support system.
3. Indicate existing and proposed utilities, structures or other obstructions.
4. Show wall elevations and locations of bracing.
5. Show overall installation sequence and removal of bracing. Indicate work levels to be performed before bracing is installed or removed.
6. Method of preloading bracing, if required, including preload for each member, and method of locking-off the preload. Submit detailed drawings of connections, jacking supports, and method of shimming.
7. Include procedures for resolving difficulties arising from misalignment of members exposed during excavation and criteria for implementing those procedures.

B. Design Calculations: For excavation support and protection system. Include analysis data prepared, signed, and sealed by professional engineer responsible for their preparation.

1. Include loads on excavation support system for all stages of excavation, bracing removal, and concrete placement, including material and equipment loads on adjacent ground during construction.
2. Include design of wall and bracing members including details for all construction stages.
3. Include theoretical deflections of excavation support system and deformation of structures, pipelines, and other improvements located within areas influencing excavations.

1.5 INFORMATIONAL SUBMITTALS

A. Submit quality control measures to ensure that performance of excavation support system complies with project requirements.

B. Submit welder qualifications and weld procedures in accordance with AWS D1.1.

C. Maintain at least one copy of design at job site during excavation that includes a plan indicating sizes, types, and configurations of the materials to be used in protective system. Identity registered Contractor's design engineer who stamped the design.

D. Do not proceed with excavation support or protection activities until submittals have been reviewed and approved by the Engineer.

1.6 QUALITY ASSURANCE

A. Contractor Qualifications: Minimum 5 years' experience compatible to indicated Work, and who employs labor and supervisory personnel similarly experienced in Work of this Section.

B. Contractor's Design Engineer: Registered Professional Engineer in State were the work is located with at least 5 years' professional experience in design and construction of support of excavation systems and having completed a minimum of 5 successful excavation support projects of equal type, size, and complexity to specified work.

C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by

inadequate performance of excavation support and protection systems. Submit before Work begins.

D. Regulatory Requirements: Comply with authorities having jurisdiction, including OSHA requirements.

E. Record Drawings: Identify locations and depths of capped or relocated utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.7 FIELD CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Contact utility companies and other responsible authorities to locate and mark underground utilities.
2. Notify the Owner no fewer than two days in advance of proposed interruption of utility.
3. Do not proceed with interruption of utility without the Engineer's and Owner's written permission.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide, design, monitor, and maintain excavation support and protection system to comply with corresponding submittals which have been reviewed and approved by Engineer.

1. Contractor Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Install excavation support and protection systems to minimize horizontal and vertical movements without damaging existing buildings, structures, and site improvements adjacent to excavation.
4. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

B. Do not permit excavations below the level of the base of adjacent existing foundations or retaining walls, unless excavation design and bracing includes an analysis of stability of structure supported by foundation and if necessary, incorporates required bracing or underpinning of foundation.

C. For support systems in which bracing is installed between opposite sides of the excavation, design excavation support of both sides to be nearly the same as feasible.

D. Where necessary to resist point loads, fill pipe piles used as soldier piles with concrete. Do not consider concrete strength in design of pipe pile for bending stress.

E. Design, install, operate, and maintain ground water control system to control ground water inflows, prevent piping or loss of ground, and maintain stability of the excavation.

F. Design review and field monitoring activities by Owner or the Engineer does not relieve Contractor of its work responsibilities.

2.2 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Pipe Used as Soldier Piling: ASTM A 252.

D. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

1. Corners: Site-fabricated mechanical interlock.

E. Steel Liner Plates: ASTM A 1101, structural quality hot-rolled carbon steel sheets or plates of either the two- or four-flange type, punched for bolting on all sides. Space bolts according to manufacturer's standards and be multiples of plate length, so members having same curvature are interchangeable with bolt numbers and patterns determined by liner supplier.

1. Tensile Strength: 42,000 psi
2. Yield strength: 28,000 psi

F. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of 3 inches with minimum allowable flexural strength of 1,100 psi.

G. Cast-in-Place Concrete: ACI 301, with minimum compressive strength of 3,000 psi ,unless a higher strength is required for application.

H. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

PART 3 - EXECUTION

3.1 PREPARATION

A. Obtain permits from local authority having jurisdiction prior to initiating excavation work.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

C. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
2. Install fencing, gates, lights, and signs around excavations and staging areas to provide for public safety.

D. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

3.2 GENERAL

A. Install excavation support systems in accordance with the shop drawings, approved submittals, and applicable permits.

B. Fill voids between excavation support system and earth with materials acceptable to the Engineer.

C. If unstable material is encountered during excavation, take immediately measures to contain it in place and prevent ground displacement.

D. If settlement or deflections of supports indicate that support system requires modification to prevent excessive movements, redesign and resubmit revised shop drawings and calculations to the Engineer without additional compensation.

E. Maintain sufficient quantity of material on site for protection of work and for use in case of accident or emergency.

3.3 PORTABLE TRENCH BOXES

A. Use portable trench boxes or sliding trench shields only for worker protection.

B. Additional excavation, backfilling, and surface restoration required as result of trench box use shall be provided without additional compensation.

C. Design, construct, and maintain trench boxes or shields to meet acceptable engineering and industry standards.

D. Install shields in a manner to restrict lateral or other hazardous movement of the shield in the event of sudden lateral loads.

E. Maintain a written copy of trench box manufacturer's specifications, recommendations, and limitations at job site during excavation work.

3.4 INTERNAL BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work, unless otherwise approved by the Engineer.
2. Install internal bracing if required to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

B. Provide internal bracing to carry maximum design load without distortion or buckling.

C. Include web stiffeners, plates, or angles required to prevent rotation, crippling, or buckling of connections and points of bearing between structural steel members. Allow for eccentricities caused by field fabrication and assembly.

D. Install and maintain bracing support members in tight contact with each other and with the surface being supported.

E. Coordinate excavation work with installation of bracing. Extend excavation no more than 2 feet below any brace level prior to installation of the bracing.

F. Use procedures that produce uniform loading of bracing member without eccentricities, overstressing, or distortion of system members.

3.5 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.6 REMOVAL

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to

avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
2. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earthwork."
3. Repair or replace, as approved by Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.

B. Do not remove vertical support members that were installed within zone of influence of new or existing structures. Cut off support members installed within this zone at 5 feetbelow finished grade and abandon in place.

C. Do not remove internal bracing or transfer loads to permanent structure without prior acceptance of the Engineer.

D. Begin removal at excavation bottom and progress upward. Slowly release members noting indication of possible failure of remaining members or possible cave-in of excavation sides.

E. Progress backfilling together with removal of support systems from excavations.

F. Remove all portions of excavation support, unless otherwise indicated by approved Shop Drawings.

1. Zone of Influence Definition: Zone extending down and away from outer edge of the structure at 1 horizontal to 1 vertical.

G. Do not leave wood as part of abandoned portion of the work.

H. When removing excavation support system, do not disturb or damage adjacent buildings, structures, waterproofing material, or utilities. Fill voids immediately with lean concrete or well-graded cohesionless sand or as directed by the Engineer.

I. Immediately remove excavation support system material from site.

END OF SECTION 315000

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SECTION 321216 - PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Asphalt materials.
2. Aggregate materials.
3. Aggregate subbase.
4. Asphalt paving base course, binder course, and wearing course.

B. Install all pavement and curb and gutter on prepared where shown on the Drawings.

C. Pavement patch at locations required to demolish existing features, install below grade utilities or other features, or as otherwise required to correct pavement damaged due to the Work.

D. Traffic control and protection to allow the Owner continuous use to maintain their existing operations in a safe manner such as furnishing, placing, and maintaining signs, barricades, steel plates and other traffic control devices as required for the safe and continuous passage of traffic onsite.

E. Slope all paved surfaces and curb and gutter to drain.

F. Related sections:

1. Section 312333 “Trenching and backfilling.”
2. Section 310515 “Soils and Aggregates for Earthwork.”

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit product information for asphalt and aggregate materials (for aggregate materials Submit in Section 310515 and identify on submittal that aggregate applies to work in this Section).
2. Submit mix design with laboratory test results supporting design.

3. Name, address, and telephone number of the certified independent laboratory and field-testing firm(s) that will be used by the Contractor to test pavement.

1.4 REFERENCE STANDARDS

A. Illinois Department of Transportation (IDOT):

1. IDOT Standard Specifications for Road and Bridge Construction (latest edition) herein referred to as the "IDOT Standard Specifications."

1.5 QUALITY ASSURANCE

A. The Contractor shall have experience with Work comparable to that shown on the Drawings employing labor, and supervisory personnel who are similarly experienced in this type of work.

B. Certified Independent Laboratory and Certified Independent Field-Testing Agency:

1. Certified independent laboratory and certified independent field-testing agency engaged by the Contractor and acceptable to the Engineer shall be utilized to perform all field testing.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE COURSE, AGGREGATE SUBBASE, AND CRUSHED STONE

A. As approved in Section 310515 "Soils and Aggregates for Earthwork" for coarse aggregate materials.

2.2 PRIME AND TACK

A. The bituminous material used for the prime and tack coats shall be one of the types listed in Section 405 HOT-MIX ASPHALT BINDER AND SURFACE COURSE, Article 406.02 which is further detailed in Article 1032 of the IDOT Standard Specifications.

2.3 HOT MIX ASPHALT

A. Hot mix asphalt (HMA) binder and surface course shall meet the material requirements of Section 406 HOT-MIX ASPHALT BINDER AND SURFACE COURSE, Article 406.02 which are detailed in Articles 1030 and 1003.03 of the IDOT Standard Specifications. The surface course shall be N50, IL 9.5, and the binder course shall be N50, IL 19.0 to the dimensions shown on the Drawings.

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PART 3 - EXECUTION

3.1 DEMOLITION

A. Saw cut and notch existing paving (asphalt and concrete) at the locations shown on the Drawings. Use device capable of making a neat, reasonable straight, and smooth cut without damaging adjacent pavement that is not to be removed.

B. If Contractor damages pavement outside of those areas shown on the Drawings, the pavement shall be removed at no additional cost to the Owner.

C. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

D. Repair surface defects in existing paving to provide uniform surface to receive new paving.

E. Just prior to pavement placement the trimmed edges shall be painted with a coating of prime coat immediately prior to constructing the new abutting pavement surface.

3.2 INSTALLATION

A. Perform any structure frame and grate adjustment required prior to the start of paving activities. Perform in accordance with Section 602 CATCH BASIN, MANHOLE, DRAINAGE STRUCTURE, AND VALVE VAULT CONSTRUCTION, ADJUSTMENT, AND RECONSTRUCTION of the IDOT Standard Specifications. Any broken adjustment rings shall be replaced in kind using adjustment rings allowed in Section 1043 of the IDOT Standard Specifications.

B. Preparation of Subgrade:

1. Prepare subgrade using the equipment types and in accordance with Section 301, SUBGRADE PREPARATION of the IDOT Standard Specifications.
2. After the subgrade has been prepared and has been approved by the Engineer, it shall be brought to final grade and contour and thoroughly compacted.
3. Testing:

    a. When compacted, the subgrade shall have a minimum dry density meeting the requirements of Section 310515 “Soils and Aggregates for Earthwork”.

C. Aggregate Base Course:

1. Installation:

    a. Install the aggregate base course only after receiving written approval from the Engineer that the subgrade is acceptable for material placement.
    b. Install at the locations and to the depths shown on the Drawings.
    c. Aggregate base course shall be installed using the equipment types and in accordance with Section 311, GRANULAR SUBBASE of the IDOT Standard Specifications. The aggregate base course shall be spread in the required quantity

and shaped so that when compacted and finished it will be of a thickness shown on the Drawings. Frozen material shall not be used.

2. Testing:

   a. The in-place field dry density of the compacted aggregate base course shall be determined in accordance with Article 311.05 of the IDOT Standard Specifications.

D. Hot-Mix Asphalt

1. Install the hot-mix asphalt only after receiving written approval from the Engineer that the aggregate base course is acceptable for material placement.
2. Hot-mix asphalt shall be installed using the materials, equipment, and construction methods of Section 406 HOT-MIX ASPHALT BINDER AND SURFACE COURSE of the IDOT Standard Specifications. HMA surface shall be installed at the locations and to the depths shown on the Drawings, areas disturbed by the Contractor, or as directed by the Engineer.
3. Prime coat applied to aggregate bases as follows:

   a. Aggregate base: prime shall be applied at a rate of 0.25 to 0.50 gallons per square yard. The exact rate to be specified by the Engineer.

4. Placing of Mixture:

   a. The placement of the surface coat shall be performed in accordance with Section 406 of the IDOT Standard Specifications as well as the following:

      1) The mixture shall be laid upon an approved surface, spread and struck off to grade. Bituminous pavers shall be used to distribute the mixture.
      2) The longitudinal edge of the existing pavement shall be painted with a thin uniform coating of tack coat material where it will adjoin new pavement.
      3) When bituminous concrete is laid against vertical surfaces such as concrete curbs or gutters, the face of the vertical surface to be in contact with the bituminous concrete shall be roughened for proper bonding, cleaned, and then painted with a light coating of tack coat.
      4) At terminations of new surface course, the bituminous concrete shall be feathered into the existing surface over such a distance as may be required to produce a smooth riding transition.
      5) The finished surface shall be of uniform texture. When tested with a 10 ft straightedge, the variation of the surface from the testing edge of the straightedge shall not be more than 1/4-in except at grade changes.
      6) The top of pavement shall match utility surface features such as valve boxes, corrosion protection test station boxes, electrical and telephone pull boxes, utility vaults, catch basin inlets, sewer frames and lids, and other structures located within the limits to be paved. Wherever possible drainage should be directed away from such utility structures, except drainage structures such as curb inlets or catch basin inlets.
      7) Compact each lift of the bituminous concrete to at least 95 percent of the relative compaction as determined by ASTM D1188 or ASTM D2726. Verification of compaction shall be performed by the Contractor on each

compacted lift or course utilizing in place nuclear gage with measurements in accordance with ASTM D2950, and collected on a 25-foot grid.

5. Testing:

   a. Measurement for verification of the rate of prime coat application shall be as outlined in Article 1032.02.
   b. The bituminous stabilized HMA surface course shall be compacted and tested by the Material Tester as required by Article 1030.05(d)(3), (d)(4), and (d)(7) of the IDOT Standard Specifications. Quality control testing to the required density and frequency based on the mixture composition and N design placed.

E. TRAFFIC MAINTENANCE AND PROTECTION

1. The Contractor shall perform all traffic maintenance and protection in accordance with IDOT Standard Specification Section 700. This work shall consist of furnishing, placing and maintaining signs, barricades, steel plates, and other traffic control devices to allow for the safe maintenance and control of traffic for the duration of the Work.

3.3 SPECIAL REQUIREMENTS

A. The restoration of all surfaces, as described herein, disturbed by the installation or repair associated with the Work shall be completed as soon as is reasonable and practical.

B. At locations where cold mix asphalt is approved by the Engineer for temporary installation prior to final placement of asphalt, the Contractor shall continuously maintain these areas to provide a smooth driving surface until permanent pavement is installed.

C. Following final completion, the Contractor shall repair settled pavement installed with the Work. This work shall be performed by the Contractor at no additional cost to the Owner. The work shall be performed to the limits and in a manner satisfactory to the Engineer.

3.4 CLEAN-UP

A. After all installation, repair, and restoration of paving has been completed, all excess asphalt, dirt, rock and other debris shall become the property of the Contractor and removed from the site. Adjoining curbs and gutters, structures, and other surfaces over-sprayed or splattered shall be cleaned of all asphalt concrete products.

B. Replace any traffic markings with a water-based traffic marking paint at the locations and matching the color of the traffic marking paint that was removed.

END OF SECTION 321216

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SECTION 400506 - COUPLINGS, ADAPTERS, AND SPECIALS FOR PROCESS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe penetrations
2. Pipe Sleeves
3. Sealing Materials
4. Sleeve-type couplings.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping"
2. Section 079200 "Joint Sealants"
3. Section 099100 "Painting": Product and execution requirements for painting specified by this Section
4. Section 400507 "Hangers and Supports for Process Piping": Hangers, anchors, sleeves, and sealing of piping to adjacent structures
5. Section 400531 "Thermoplastic Process Pipe": Plastic piping materials and appurtenances

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): The sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire-rated construction.

B. FM: Factory Mutual Insurance Company; FM Global is the communicative name of the company.

C. WH: Warnock Hersey; indicates compliance to relevant building codes, association criteria, and product safety and performance standards.

1.4 COORDINATION

A. Section 013100 "Project Management and Coordination": Requirements for coordination.

B. Coordinate Work of this Section with installation of piping, valves and equipment connections specified in other Sections and indicated on Drawings.

1.5 PREINSTALLATION MEETINGS

A. Section 013100 "Project Management and Coordination": Requirements for preinstallation meeting.

1.6 SUBMITTALS

A. Section 013300 "Submittal Procedures": Requirements for submittals.

B. Product Data:

1. Submit manufacturer catalog information for each specified product, including installation instructions.
2. Firestopping: Submit data on product characteristics, performance, and limitation criteria.
3. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
4. Expansion Joints: Indicate maximum temperature, pressure rating, and expansion compensation.

C. Shop Drawings:

1. Identification:

    a. Submit list of wording, symbols, letter size, and color coding for pipe identification.
    b. Comply with ASME A13.1.

2. Indicate restrained joint details and materials.
3. Submit layout drawings showing piece numbers and location, indicating restrained joint locations.
4. Indicate layout of piping systems, including flexible connectors, expansion joints and compensators, loops, offsets, and swing joints.

D. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings for maintenance of fire-resistance rating of adjacent assembly.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Welder Certificates: Certify welders and welding procedures employed on Work, verifying AWS qualification within previous 12 months.

G. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions for:

1. Flexible connectors
2. Expansion joints
3. Firestopping Engineering Judgments: For conditions not covered by UL- or WH-listed designs, submit judgments by licensed professional engineer suitable for presentation to authority having jurisdiction to accept as meeting fire-protection code requirements.

H. Manufacturer Instructions: Submit special procedures and setting dimensions.

I. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

J. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

K. Qualifications Statements:

1. Submit qualifications for manufacturer, installer, and licensed professional.
2. Submit manufacturer's approval of installer.
3. Welders: Qualify procedures and personnel according to AWS D1.1/D1.1M.

American Iron and Steel (AIS): Submit certification indicating compliance with requirements.

1.7 CLOSEOUT SUBMITTALS

A. Section 017700 “Closeout Procedures”: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping appurtenances.

C. Identify and describe unexpected variations to pipe routing or discovery of uncharted utilities.

1.8 QUALITY ASSURANCE

A. Materials in Contact with Potable Water: Certified to NSF Standards 61 and 372.

B. Perform Work according to ASME B31.9 for installation of piping systems and according to AWS D1.1/D1.1M for welding materials and procedures.

C. Perform Work according to ASME B31.3 for installation of piping systems.

D. Through-Penetration Firestopping of Fire-Rated Assemblies:

1. Comply with UL 1479 or ASTM E814.
2. Minimum Positive Pressure Differential: 0.1-inch wg to achieve fire F-ratings and temperature T-ratings as indicated on Drawings, but not less than one hour.
3. Wall Penetrations: Fire F-ratings as indicated on Drawings, but not less than one hour.
4. Floor Penetrations:

    a. Fire F-ratings and Temperature T-ratings: As indicated on Drawings, but not less than one hour.

b. Floor Penetrations within Wall Cavities: T-rating is not required.

E. Through-Penetration Firestopping of Non-fire-rated Floor Assemblies:

1. Materials to resist free passage of flame and products of combustion.
2. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
3. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.

F. Fire-Resistive Joints in Fire-Rated Floor, Roof, and Wall Assemblies:

1. Comply with ASTM E1966 or UL 2079.
2. Rating: As indicated on Drawings for assembly in which joint is installed.

G. Fire-Resistive Joints between Floor Slabs and Exterior Walls:

1. Comply with ASTM E119.
2. Minimum Positive Pressure Differential: 0.1-inch wg to achieve fire-resistance rating as indicated on Drawings for floor assembly.

H. Surface-Burning Characteristics: Maximum 25/450 flame-spread/smoke-developed index when tested according to ASTM E84.

1.9 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years' experience.

B. Installer: Company specializing in performing Work of this Section with minimum five years' experience.

C. Welders: AWS qualified within previous 12 months for employed weld types.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

2. Furnish temporary end caps and closures on piping and fittings and maintain in place until installation.
3. Provide additional protection according to manufacturer instructions.

1.11 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

1.12 WARRANTY

A. Section 017700 "Closeout Procedures": Requirements for warranties.

PART 2 - PRODUCTS

2.1 PIPE PENETRATIONS

A. Performance and Design Criteria:

1. Firestopping Materials: As specified in Section 078413 – Penetration Firestopping.
2. Firestop interruptions to fire-rated assemblies, materials, and components.
3. Firestopping: Provide certificate of compliance from authority having jurisdiction, indicating approval of materials used.

2.2 PIPE SLEEVES

A. All construction except new concrete walls:

1. Material: Schedule 40 galvanized steel conforming to ASTM A53.
2. 2-inch minimum circumference water stop welded to exterior sleeve at midpoint

2.3 SEALING MATERIALS

A. Mechanical seals:

1. Of rubber links shaped to continuously fill the annular space between the pipe and the wall opening or sleeve.
2. Link pressure plates molded of glass reinforced nylon:

    a. colored throughout elastomer,
    b. permanent identification of the size and manufacturer's name molded into the pressure plate and sealing element.

3. Hardware:

    a. Mild steel with a 60,000 psi minimum tensile strength
    b. 2-part Zinc Dichromate coating per ASTM B-633
    c. Organic Coating, tested in accordance with ASTM B-117 to pass a 1,500-hour salt spray test.
    d. Use Type 316 Stainless Steel hardware:

        1) in chemical areas
        2) for submerged service
        3) for penetrations in tanks containing sludge or wastewater.

4. Completed sealing system:

    a. Duty pressure rated for 20 psig differential pressure.
    b. EPDM for all services except fire rated assemblies

        1) fire rated seals use silicone link material.

    c. Manufacturer: PSI-Thunderline/ Link-Seal as manufactured by Pipeline Seal & Insulator, Inc., Houston, TX, or pre-approved equal.

2.4 MISCELLANEOUS MATERIALS

A. Bonding compound:

1. Sikadur Hi-Mod epoxy by Sika Corp.;
2. Euco 452 by Euclid Chemical Corp.; Master Builders Company
3. or equal.

B. Non-shrink grout:

1. Masterflow 713 by Master Builders Co.;
2. Euco NS by Euclid Chemical Co.;
3. Five Star Grout by U.S. Grout Corp.
4. or equal.

2.5 FLEXIBLE CONNECTIONS

A. Manufacturers:

1. For pressure pipe applications and applications with copper piping: Flexicraft Industries, Chicago, IL; Hyspan Precision Products, Inc.; Metraflex Company, Chicago, IL; Victaulic Company, Easton, PA or equal.
2. For non-pressurized applications involving plastic, clay, asbestos cement, or cast iron applications: Fernco or equal.

2.6 FINISHES

A. Prepare piping appurtenances for field finishes as specified in Section 099100 - Painting.

2.7 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for testing, inspection, and analysis.

1. Provide shop inspection and testing of completed assemblies.

B. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017300 “Execution”: Requirements for installation examination.

B. Verify that field dimensions are as indicated on Drawings.

C. Inspect existing flanges for nonstandard bolthole configurations or design and verify that new pipe and flanges mate properly.

D. Verify that openings are ready to receive sleeves and firestopping.

E. Verify that pipe plain ends to receive sleeve-type couplings are smooth and round for 12 inches from pipe ends.

F. Verify that pipe outside diameter conforms to sleeve manufacturer's requirements.

3.2 PREPARATION

A. Section 017300 “Execution”: Requirements for installation preparation.

B. Cleaning: Thoroughly clean end connections before installation.

C. Close pipe and equipment openings with caps or plugs during installation.

D. Surface Preparation: Clean surfaces to remove foreign substances.

3.3 INSTALLATION

A. According to ASME B31.3.

B. Coating: Finish piping appurtenances as specified in Section 099100 - Painting for service conditions.

C. Pipe Penetrations:

1. Flashing:

a. Provide flexible flashing and metal counterflashing where piping penetrates weatherproofed or waterproofed walls, floors, and roofs.
b. Flash floor drains with topping over finished areas with lead, 10 inches clear on sides, with minimum 36-by-36-inch sheet size.
c. Fasten flashing to drain clamp device.

2. Sleeves:

a. Exterior Watertight Entries: Seal with dual fire rated mechanical sleeve seal assemblies.
b. Set sleeves in position in forms and provide reinforcement around sleeves.
c. Size sleeves large enough to allow for movement due to expansion and contraction and provide for continuous insulation wrapping.

D. Firestopping:

1. Materials: As specified in Section 078413 – Penetration Firestopping.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. After installation, inspect for proper supports and interferences.

C. Repair damaged coatings with material equal to original coating.

3.5 CLEANING

A. Sections 017300 “Execution” and 017700 “Closeout Procedures”: Requirements for cleaning.

B. Keep equipment interior clean as installation progresses.

END OF SECTION 400506

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SECTION 400507 - HANGERS AND SUPPORTS FOR PROCESS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. This specification requires Contractor to delegate pipe support design to a pipe support design engineer hired by the Contractor. Where the Drawings show support types and/or locations, they shall be analyzed for adequacy to support loads and stresses calculated by the pipe support designer, modified if required, installed generally where shown, and integrated with the pipe support system design provided by the Contractor.

C. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete": Execution requirements for placement of concrete housekeeping pads specified by this Section.
2. Section 099100 "Painting and Coating": Product and execution requirements for painting specified by this Section.
3. Section 400506 "Couplings, Adapters, and Specials for Process Piping."
4. Section 400517 "Copper Process Pipe and Tubing."
5. Section 400531 "Thermoplastic Process Pipe."
6. Section 463126 "Ammonia Gas Feed Equipment."

1.2 COORDINATION

A. Coordinate Work of this Section with piping and equipment connections specified in other Sections and indicated on Drawings.

1.3 PREINSTALLATION MEETINGS

A. Convene minimum one week prior to commencing Work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's catalog data including load capacity.

B. Shop Drawings: Submit scaled piping layouts for each system. Indicate flow stream, pipe size(s) material(s), schedule(s), lining(s), critical dimensions between pipes, equipment and building features. Indicate by schedule pipe hanger/support type and locations. Provide detail of each type of hangers, supports, anchors, and guides.

C. Delegated Design Submittals: Support System Design:

1. Engage the services of an independent registered professional engineer licensed in the State of Illinois ordinarily engaged in the business of pipe support systems analysis and design, to analyze system piping and service conditions, and to develop a detailed support system design, specific to the piping material, pipe joints, valves, and piping appurtenances proposed for use:

   a. The proposed support system engineer shall have at least 5 years of experience in the analysis and design of similar systems, including the use of commercial and custom pipe supports and in the use of commercial pipe stress software programs.
   b. Engineer pre-approved support system engineering groups include the following:

      1) J. Blanco Associates, Inc. Hawthorne, NJ.
      2) Fenny Engineering Company, Venice, FL.
      3) LCI Engineering, Ottawa, Ontario, Canada.

2. The support system design shall include:

   a. Criteria by piping system.
   b. Summary of Contractor-selected related components including joints, class, valves, appurtenances, etc., and commercial supports and especially including pipe materials.
   c. Dead weight and dynamic analysis, including system thermal effects and pressure thrusts. Computer-based software system equivalent to Bentley Systems AutoPIPE or SST Systems CAEPIPE:

      1) Present each system in an isometric graphic and show the resolved and resultant force and moment systems, as well as all recommended hangers, supports, anchors, restraints, and expansion/flexible joints.

   d. Submit a support system design to the Engineer for review. The submittal needs to be stamped by a professional engineer registered in the State of Illinois.
   e. All aspects of the analysis and design to comply with the provisions of ANSI B31.3 and the referenced standards.
   f. Coordinate support arrangements to eliminate interference with similar systems to be installed under HVAC, Plumbing, and Electrical; to account for structural expansion joints and to maintain access for both personnel and for the removal of equipment.

D. Manufacturers' Instructions: Submit special procedures and assembly of components.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

B. Qualifications Statements:

1. Submit qualifications for manufacturer, fabricator, installer, and licensed professional.
2. Submit manufacturer's approval of installer.

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1.6 DEFINITIONS

A. Ferrous Metal: Iron, steel, stainless steel, and alloys with iron as principal component.

B. Wetted or submerged: Submerged, less than 1-foot above liquid surface, below top of channel or tank wall, under cover or slab of channel or tank, or in other damp locations.

C. "Pipe" or "piping" shall mean all piping, piping system(s), hose, tube, fittings, joints, valves, and similar appurtenances.

D. Supports: wherever the word "supports" or "pipe supports" are used, they shall mean pipe supports, hangers, structural connections, concrete inserts (if allowed), anchors, guides, bolts, expansion units, restraints and all restraint, hanging, supporting, allowing controlled expansion, or other means of attaching piping along with the necessary appurtenances.

1.7 DELIVERY, STORAGE AND HANDLING

A. All supports and hangers shall be crated, delivered and uncrated so as to protect against any damage.

B. All parts shall be properly protected so that no damage or deterioration shall occur during a prolonged delay from the time of shipment until installation is completed.

C. Finished metal surfaces not galvanized, that are not of stainless steel construction, or that are not coated, shall be grease coated, to prevent rust and corrosion.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years' experience.

B. Fabricator: Company specializing in fabricating products specified in this Section with minimum three years' experience.

C. Installer: Company specializing in performing Work of this Section with minimum three years' experience.

D. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of Illinois.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on-Site in original factory packaging, labeled with manufacturer's identification.

B. Protect products from weather and construction traffic, dirt, water, chemical, and damage by storing in original packaging.

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1.10 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 GENERAL

A. Support pipe and appurtenances connected to equipment to prevent any strain being imposed on the equipment. Comply with manufacturer's requirements regarding piping loads being or not being transmitted to their equipment. Submit certification stating that such requirements have been met.

B. Support and secure all pipe and tubing in the intended position and alignment to prevent significant stresses in the pipe or tubing material, valves, fittings, and other pipe appurtenances. Design all supports to adequately secure the pipe against excessive dislocation due to thermal expansion and contraction, internal flow forces, and all probable external forces such as equipment, pipe, and personnel contact.

C. Contractor may propose minor adjustments to the piping arrangements in order to simplify the supports, or in order to resolve minor conflicts in the work. Such an adjustment might involve minor change to a pipe centerline elevation so that a single trapeze support may be used.

D. Where flexible sleeve, split ring, vibration, or other couplings are required at equipment, tanks, etc., the end opposite to the piece of equipment, tank, etc., shall be rigidly supported to prevent transfer of force systems to the equipment. Do not install fixed or restraining supports between a flexible coupling and the piece of equipment.

E. Pipe supports:

1. Shall not induce point loadings but shall distribute pipe loads evenly along the pipe circumference.
2. Provide supports at changes in direction and elsewhere as shown in the Drawings or as specified herein.
3. No piping shall be supported from other piping or from metal stairs, ladders, and walkways, unless specifically directed or authorized by the Engineer.
4. Provide pipe supports to minimize lateral forces through valves, both sides of flexible split ring type couplings and sleeve type couplings, and to minimize all pipe forces on pump housings. Pump housings shall not be utilized to support connecting pipes.
5. Effects of thermal expansion and contraction of the pipe to be accounted for in the pipe support selection and installation.

F. Insofar as is possible, floor supports shall be given preference. Where specifically indicated, concrete supports, as shown on the Drawings, may be used. Base elbow and base tees shall be supported on concrete pedestals.

G. Restraints, flexible connections, expansion items, and related items as included in other specifications and shown on the Drawings.

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2.2 PERFORMANCE REQUIREMENTS/DESIGN CRITERIA

A. All supports and appurtenances shall be standard products from approved manufacturers wherever possible and shall be adequate to maintain the supported load in proper position under all operating conditions. Any reference to a specific figure number of a specific manufacturer is for the purpose of establishing a type and quality of product and shall not be considered as proprietary. Note that different materials required, as specified in Part 2 MATERIALS, may require different figures or model numbers than those shown.

1. The minimum working factor of safety for all items, with the exception of springs, shall be five times the ultimate tensile strength of the material, assuming 10 feet of water-filled pipe being supported and normal test pressures.
2. Design for all loads using a safety factor of 5.

B. All items shall be designed with strength and stiffness to support, restrain, and allow expansion of the respective pipes under the maximum combination of peak loading conditions to include pipe weight, liquid weight, liquid movement and pressure forces, thermal expansion and contraction, vibrations, and all probable externally applied forces.

C. Support spacing shall be per ASME B31.3.

D. Complete design details of the pipe system components shall be submitted for review and approval as specified in Part 1. No support shall be installed without approved support system Drawings.

E. The pipe support system shall not impose loads on the supporting structures in excess of the loads for which the supporting structure is designed.

F. Pipe will be supported by existing structures. The allowable loads for the existing structures are listed in the table below.]

Structure	Allowable Live Load (lbs)	Allowable Dead Load (lbs)
Existing Floor/Wall/ Suspended Slab	0	200

2.3 MATERIALS

A. For support of metallic pipe:

1. Submerged, buried, or within outdoor structures (vaults, etc.): Type 316 stainless steel (SS).
2. Within chemical areas: Vinyl ester fiberglass reinforced plastic (FRP) for pipe size up to 2 inch, epoxy coated steel for 2-1/2 inches size and larger.
3. Other locations: steel with galvanizing where noted, or if not otherwise noted, coating as required in Division 09 Finished Painting.
4. Additional requirements (including dielectric insulation): see following paragraphs.

B. For support of non-metallic pipe:

1. Submerged, buried, or within vaults: Type 316 stainless steel or FRP.
2. Within chemical areas: vinyl ester FRP.
3. Other locations: steel with galvanizing where noted, or if not otherwise noted, coating as required in Division 09 Finished Painting; all with local stress protection shields.
4. Additional requirements (including stress protection shields): see following paragraphs

C. Wherever stainless steel is noted, it shall be Type 316 unless noted otherwise.

2.4 SUPPORT AND RESTRAINT SYSTEMS

A. Steel or Ductile Iron Piping

1. Cast iron and ductile iron, steel, and stainless steel piping shall be supported at a maximum support spacing of 5 feet with a minimum of one support per pipe section at the joints.

B. Copper Piping

1. Supports for copper pipe shall be copper plated or shall have a 1/16 inch plastic coating.
2. Support spacing for copper piping and tubing 2 inch and smaller diameter shall not exceed 5 feet and greater than 2 inch diameter shall not exceed 8 feet.
3. Where pipe supports come in contact with copper piping, provide protection from galvanic corrosion by: wrapping pipe with 1/16 inch thick neoprene sheet material and galvanized protection shield; isolators similar to Cooper B-Line B3195CT; or copper-plated or PVC-coated hangers and supports.

C. Non-Metallic Piping

1. All uninsulated non-metallic piping such as PVC, CPVC, HDPE, PVDF, etc., shall be protected from local stress concentrations at each support point. Protection shall be provided by non-metallic protection shields or other method as approved by the Engineer.

    a. Where pipes are bottom supported 180 degrees, arc shields shall be furnished. Where 360-degree arc support is required, such as U-bolts, protection shields shall be provided for the entire pipe circumference. All U-bolts or clamps for non-metallic pipes shall be plastic coated.
    b. Protection shields shall have an 18-gauge minimum thickness, not be less than 12 inches in length, and be securely fastened to pipe with Type 316 stainless steel straps not less than 1/2 inch wide.

2. Individually supported PVC pipes shall be supported as recommended by the pipe manufacturer except that support-spacing shall be manufacturers recommendation minus 2-ft. down to 5 ft spacing recommendation, then spacing shall be 3 feet.
3. Supports for horizontal multiple PVC plastic piping:

    a. Shall be continuous wherever possible.

b. Multiple, suspended, horizontal plastic PVC pipe runs, where possible, shall be supported by ladder type cable trays such as: Husky Ladder Flange Out by MPHusky; or equal.
c. Rung spacing shall be 12 inches. Tray width shall be approximately 6 inch for single runs and 12 inches for double runs.
d. Ladder type cable trays shall be furnished complete with all hanger rods, rod couplings, concrete inserts, hanger clips, etc., required for a complete support system. Individual plastic pipes shall be secured to the rungs of the cable tray by strap clamps or fasteners similar to: Globe, Series 600; Unistrut Pipe/Conduit Clamps and Hangers; or equal.
e. Spacing between clamps shall not exceed 9 feet. The cable trays shall provide continuous support along the length of the pipe. Individual clamps, hangers, and supports in contact with plastic PVC pipe shall provide firm support but not so firm as to prevent longitudinal movement due to thermal expansion and contraction.

D. All vertical pipes shall be supported at each floor or at intervals of not more than 12 feet by approved pipe collars, clamps, brackets, or wall rests and at all points necessary to ensure rigid construction. All vertical pipes passing through pipe sleeves shall be secured using a pipe collar.

2.5 ANCHOR BOLTS/SYSTEMS

A. Anchoring Devices: Design, size, and space support anchoring devices, including anchor bolts, inserts, and other devices used to anchor support, to withstand shear, and pullout loads imposed by loading and spacing on each particular support. DO NOTE USE ADHESIVE ANCHOR BOLTS ON ANY PIPE SUPPORT HUNG FROM A ROOF OR CEILING, unless specifically noted otherwise.

B. All post-installed anchors in concrete shall have current published ICC-ES Evaluation Report indicating the anchor is approved for installation in cracked concrete.

C. The latest edition of the following specification and recommended practices shall become part of this specification as if written herein. Wherever requirements conflict, the more stringent shall govern.

1. ACI 318, Appendix D.
2. ACI 355.2, Mechanical Anchors "Qualification of Post-Installed Mechanical Anchors in Concrete"
3. Anchor manufacturer's published installation requirements.

D. Expansion anchors:

1. The length of expansion bolts shall be sufficient to place the wedge portion of the bolt a minimum of 1 inch behind the steel reinforcement.
2. Manufacturers:

a. Power-Stud+ SD4 and Power-Stud+ SD6 by Powers Fasteners, Brewster, NY,
b. Kwik Bolt as manufactured by Hilti USA, Tulsa, Oklahoma; or
c. Wej-it by Wej-it Expansion Products, Inc., Broomfield, Colorado.

E. Unless otherwise noted: use Type 304 stainless steel anchoring parts/bolts and hardware for non-submerged supports, Type 316 stainless steel for submerged anchors.

F. Size of anchor bolts as designed by manufacturer, 1/2 inch minimum diameter, or as shown on the Drawings.

G. Anchors to concrete in chemical areas shall be epoxy secured vinyl ester FRP all thread, insertion depth and size as required by the manufacturer for the design loads. Nuts, bolts and hardware shall all be vinyl ester FRP construction.

2.6 HANGER RODS

A. Where use of steel is allowed, hanger rods shall be hot-rolled steel, machine-threaded, and, except for stainless steel, galvanized after fabrication. The strength of the rod shall be based on its root diameter.

1. Hanger rods shall be attached to concrete structures using single or continuous concrete inserts by the named support manufacturers above. Where use of steel is allowed, inserts shall be malleable iron or steel with galvanized finish.
2. Beam-clamps, C-clamps, or welded-beam attachments shall be used for attaching hanger rods to structural steel members.

B. Minimum rod size for metallic rod hangers: (* For pipe diameters less than 14 inch, if using pipe roller, use 2 hanger rods with minimum diameter noted below for pipe's diameter).

	Nominal Pipe / Tube Diameter	Minimum Hanger Rod Diameter
1	Less than 2-1/2 inch	1/4 inch*
2	3 to 8 inches	1/2 inch
3	10 to 14 inches	3/4 inch*
4	16 to 20 inches	2 at 1 inch
5	24 inches	2 at 1-1/4 inch
6	30 inches	2 at 1-1/2 inch

2.7 SINGLE PIPE HANGERS

A. Unless otherwise indicated, pipe hangers and supports shall be standard catalogued components, conforming to the requirements of MSS-41, 58, or 69 and shall be of the following type:

1. Anvil International
2. Equal models by: Carpenter & Patterson, Inc., Wobum, MA; Cooper B-Line; Gulf State Manufacturing; or Unistrut Northeast, Cambridge, Massachusetts.

B. Single pipes shall be supported by hangers suspended by hanger rods from structural steel members, concrete ceilings, bottom of trapeze hangers, and wall-mounted steel angle brackets.

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C. Where pipes are near walls, beams, columns, etc., and located an excessive distance from ceilings or underside of beams, welded steel wall brackets similar to Carpenter and Patterson, Figure Nos. 68, 79, 84, or 139 shall be used for hanging pipe. Where single pipes rest on top of bracket pipe supports, attachments shall meet requirements as specified under multiple pipe hangers.

2.8 MULTIPLE PIPE HANGERS

A. Suspended multiple pipes, running parallel in the same horizontal plane that are adjacent to each other, shall be suspended by trapeze type hangers or wall brackets. Where use of steel is allowed, trapeze hangers shall consist of galvanized structural steel channel supported from galvanized threaded rod or attached to concrete walls, columns, or structural steel support members. See previous paragraphs about multiple PVC pipe supports.

B. Except as otherwise specified herein, pipe anchors used for attaching pipe to trapeze or multiple pipe wall brackets shall be anchor or pipe chairs similar to:

1. Anvil Fig. 175.
2. Cooper B-Line B3147A or B3147B.
3. Where use of steel is allowed, material of construction shall be galvanized steel. Chair U bolts shall be tightened to allow freedom of movement for normal expansion and contraction except where pipe must be anchored to control direction of movement or act as a thrust anchor.

2.9 SINGLE PIPE SUPPORTS FROM BELOW

A. Single pipes located in a horizontal plane close to the floor shall be Pedestal type: Schedule 40 pipe stanchion, saddle, and anchoring flange:

1. Nonadjustable Saddle: MSS SP 58, Type 37 with U-Bolt:

   a. Anvil, Figure 259.
   b. Cooper B-Line, Figure B3090.

2. Adjustable Saddle: MSS SP 58, Type 38 without clamp:

   a. Anvil, Figure 264.
   b. Cooper B-Line, Figure B3093.

B. Pipes less than 3 inch in diameter:

1. Hold in position by supports fabricated from steel C channel, welded post base similar to Unistrut, Figure P2072A, where use of steel is allowed; and pipe clamps similar to Unistrut, Figures P1109 through 26.
2. Where required to assure adequate support, fabricate supports using two vertical members and post bases connected by horizontal member of sufficient load capacity to support pipe.
3. Fasten supports to nearby walls or other structural member to provide horizontal rigidity.
4. More than one pipe may be supported from a common fabricated support.

C. Pipes 3 inch in diameter and larger:

1. Support by adjustable stanchions.
2. Provide at least 4-inch adjustment.
3. Flange mount to floor.

D. Use yoked saddles for piping whose centerline elevation is 18 inches or greater above the floor and for all exterior installations.

E. Pipe roller type supports shall be used where required to accommodate thermal movement in conjunction with axial supports.

2.10 WALL SUPPORTED SINGLE AND MULTIPLE PIPES

A. Single or multiple pipes located adjacent to walls, columns, or other structural members shall be supported using welded steel wall brackets, where use of steel is allowed, as manufactured by Carpenter and Patterson, Figure No. 69, 84, or 139.

B. Where noted, multiple pipes may be supported on C-channel with steel brackets similar to Unistrut pipe clamps; with pipe anchor chairs; or equal.

C. Individual pipes, up to 8-in diameter, where noted, may use MSS Type 8 pipe clamps as noted on the Drawings.

D. Securely fasten all members to wall, column, etc., using double-expansion shields or other method as approved by the Engineer. Provide additional wall bearing plates as required.

2.11 BASE ANCHOR SUPPORT

A. Bend Support: Where pipes change direction from horizontal to vertical via a bend, install a welded or cast base bend support to carry the load. Fasten to the floor, pipe stanchion, or concrete pedestal using expansion anchors or other method as approved by the Engineer.

B. Concrete Supports: Where indicated, securely fasten pipe bends to concrete supports with suitable metal bands as required and approved by the Engineer. Isolate piping from poured concrete with a neoprene insert.

2.12 VERTICAL PIPE SUPPORTS

A. Where vertical pipes are not supported by a Unistrut type system as specified, they shall be supported in one of the following methods:

1. For pipes 1/4 to 2 inches in diameter:

a. Provide extension hanger ring with an extension rod and hanger flange.
b. The rod diameter shall be as recommended by the manufacturer for the type of pipe to be supported.

c. Where use of steel is allowed, the hanger ring shall be steel- or PVC-clad depending on the supported pipe material of construction. The hanger ring shall be equal to Carpenter & Patterson, Figure Nos. 81.
d. Where use of steel is allowed, the anchor flange shall be galvanized malleable iron similar to Carpenter and Patterson, Figure No. 85.

2. For pipes equal to or greater than 2 inches in diameter:

a. extended pipe clamps similar to Carpenter & Patterson, Figure No. 267 may be used.
b. Attach hanger to concrete structures using double expansion shields.
c. Attach hanger to metal support members using welding lugs similar to Carpenter & Patterson, Figure No. 114.

B. Pipe supports shall be provided for closely spaced vertical piping systems required to provide a rigid installation. The interval of vertical support spacing shall be as specified, but in no case shall vertical interval exceed 12 feet. The support system shall consist of a framework suitably anchored to floors, ceilings, or roofs.

C. Unless otherwise specified, shown, or specifically approved by the Engineer, vertical runs exceeding 12 feetshall be supported by base elbows/tees, clamps, brackets, wall rests, and pipe collars, all located as required to ensure a rigid installation.

D. Pipe riser clamps, per MSS SP58, shall be used to support all vertical pipes extending through floor slabs. Where use of steel is allowed, riser clamps shall be galvanized steel manufactured by:

1. Carpenter & Patterson, Figure No. 128.
2. Anvil, Figure 261.
3. Cooper B-Line, Figure B3373.
4. Or equal.

E. Copper-clad or PVC-coated clamps shall be used on copper pipes. Insulation shall be removed from insulated pipes prior to installing riser clamps. Insulation shall not be damaged by clamp installation.

2.13 SPECIAL SUPPORTS

A. Supports not otherwise described in this Section shall be fabricated or constructed from standard structural stainless steel or steel shapes in accordance with applicable provisions of Section 055000 "Metal Fabrications," or Unistrut-type frame; have anchor hardware similar to items previously specified herein; shall meet the minimum requirements listed below; and be subject to the approval of the Engineer.

B. Additional Pipe Support Situations:

1. Supporting Multiple Chemical and Related Piping:

a. Location: indicated on Drawings or otherwise required, especially adjacent to chemical pumps.

b. Use: framework support.
c. Materials: FRP, with proper local stress protection.

2.14 SHOP FACTORY FINISHING

A. Prepare and prime metallic (except stainless steel) supports in accordance with Division 09.

2.15 ACCESSORIES

A. Insulation Shield: Install on insulated non-steel piping. Oversize the rollers and supports, as required. Manufacturers:

1. Anvil, Figure 167.
2. Cooper B-Line, Series B3151.

B. Welding Insulation Saddle: Install on insulated metal pipe. Oversize the rollers and supports, as required. Manufacturers:

1. Anvil, Figure 160.
2. Cooper B-Line, Series B3160.

C. Vibration Isolation Pad: Install under base flange of pedestal type pipe supports adjacent to equipment, and where required to isolate vibration:

1. Isolation pads to be neoprene, waffle type.
2. Manufacturers:

a. Mason Industries, Type W.
b. Korfund.

D. Dielectric Barrier:

1. Install between carbon steel members and copper or stainless steel pipe.
2. Install between stainless steel supports and non-stainless steel ferrous metal piping.
3. All stainless steel piping shall be isolated from all ferrous materials, including galvanized steel by use of neoprene sheet material and protection shields.

E. Electrical Isolation: Install 1/4 by 3 inch neoprene rubber wrap between submerged metal pipe and oversized clamps.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field dimensions as indicated on Drawings.

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3.2 INSTALLATION

A. Obtain permission from Engineer before using powder-actuated anchors.

B. Obtain permission from Engineer before drilling or cutting structural members.

C. Inserts:

1. Install inserts for placement in concrete forms. Before setting inserts, all drawings and figures shall be checked that have a direct bearing on the pipe location. Responsibility for the proper location of pipe supports is included under this Section.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 in and larger.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

D. Pipe Hangers and Supports:

1. Install according to: ASME B31.3.
2. Install hangers with minimum 1/2 in space between finished covering and adjacent Work.
3. Place hangers within 12 in of each horizontal elbow.
4. Use hangers with 1-1/2 in minimum vertical adjustment.
5. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
6. Support riser piping independently of connected horizontal piping.
7. Design hangers for pipe movement without disengagement of supported pipe.
8. Support piping independently so that equipment is not stressed by piping weight or expansion in piping system.
9. Support large or heavy valves, fittings, and appurtenances independently of connected piping.
10. Provide welded steel brackets where piping is to be run adjacent to building walls or columns.
11. Use beam clamps where piping is to be suspended from building steel.
12. Insulated Piping: Provide two bolted clamps designed to accommodate insulated piping.
13. Use offset clamps where pipes are indicated as offset from wall surfaces.
14. The installation of pipe support systems shall not interfere with the operation of any overhead bridge cranes, monorails, access hatches, etc. No piping shall be supported from stairs, other pipes, ladders, and walkways unless authorized by the Engineer.
15. Repair mounting surfaces to original condition after attachments are made.
16. Brace horizontal pipe movements by both longitudinal and lateral sway bracing.
17. Where supports are required in areas to receive chemical resistant seamless flooring, install supports prior to application of flooring system.

E. Insulation:

1. Provide clearance in hangers and from structure and other equipment for installation of insulation.

F. Equipment Bases and Supports:

1. Provide housekeeping pads of concrete, minimum 3-1/2 in thick and extending 6 in beyond supported equipment. Comply with Section 033000 - Cast-in-Place Concrete.

G. Prime Coat:

1. Prime coat exposed steel hangers and supports.
2. Conform to Section 099100 - Painting.
3. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.3 FIELD QUALITY CONTROL

A. All pipe support systems shall be tested after installation in conjunction with the respective piping pressure tests. If any part of the pipe support system proves to be defective or inadequate, it shall be repaired, augmented or replaced to the satisfaction of the Engineer.

B. After the work is installed, but before it is filled for start-up and testing, the Support System Design Engineer shall inspect the work and shall certify its complete adequacy. Each system shall be inspected and certified in the same way.

C. Submit a report, including all field modifications and including all certificates:

1. Insert state where project is located
2. The report shall bear the stamp of a professional engineer registered in Illinois and shall be subject to the review of the Engineer.

END OF SECTION 400507

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SECTION 400517 - COPPER PROCESS PIPE AND TUBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper pipe and fittings.
2. Copper tube and fittings.
3. Accessories.

B. Related Requirements:

1. Section 400506 "Couplings, Adapters, and Specials for Process Piping" for piping appurtenances.
2. Section 400507 "Hangers and Supports for Process Piping" for hangers, anchors, sleeves, and sealing of piping to adjacent structures.

1.3 DEFINITIONS

A. Pipe: Hollow, cylindrical metal product that is normally used to transport gases or fluids, includes iron pipe size (I.P.S.) and schedule number in its classification, and is measured by the nominal outside diameter NPS and wall thickness; regardless of the wall thickness, the nominal OD of same size pipe does not change.

B. Piping: A system of pipes and fittings.

C. Tube: Hollow, cylindrical metal product that is normally used for structural purposes having an outside diameter that is not standardized for threading and is dimensionally measured on the exact outside diameter and wall thickness, often specified as a gauge.

D. Tubing: A system of tubes and fittings.

E. Soldering: Joining of metals through the use of heat and capillary flow of a filler metal having a melting temperature below 840 degrees F, and which creates a weaker bond than a brazed joint.

F. Brazing: Joining of metals through the use of heat and capillary flow of a filler metal having a melting temperature above 840 degrees F, but below the melting point of the metals being joined.

G. Flux: Material used in soldering and brazing to clean the metal surfaces and to make it easier for solder to flow over the pieces being joined.

H. DHP, Deoxidized High-residual Phosphorus Copper: Copper deoxidized with phosphorus residual in amounts 0.015 to 0.040%. The copper is not susceptible to hydrogen embrittlement. The copper is relatively low-electrical conductivity due to the amount of phosphorus present.

1.4 ACTION SUBMITTALS

A. Product Data: Submit manufacturer information regarding pipe, tube, and fittings.

B. Shop Drawings: Indicate layout of piping systems, including equipment, critical dimensions, sizes, and materials list.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

B. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

C. Qualifications Statements:

1. Submit qualifications for manufacturer, installer, and licensed professional.
2. Submit manufacturer's approval of installer.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping, valves and other appurtenances, connections, and centerline elevations.

1.7 QUALITY ASSURANCE

A. Permanently mark each length of pipe with manufacturer's name or trademark and indicate conformance to standards.

B. Materials: Certified according to NSF 61 and NSF 372.

C. Perform Work according to City of Bloomington, Illinois standards.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

B. Installer: Company specializing in performing Work of this Section with minimum three years' experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage. Photograph and provide written documentation of damaged material.

B. Store materials according to manufacturer instructions.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location.
2. Protect piping and appurtenances by storing off ground.
3. Provide additional protection according to manufacturer instructions.

1.10 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 TUBE MATERIALS

A. Tube: Seamless copper, ASTM B88, Type L, medium wall.

1. Temper H80, drawn.

2.2 FITTING MATERIALS

A. Brass tube solder type, ASTM B62, ASME B16.18.

2.3 CONNECTION MATERIALS

A. Solder (Type **CM-S**): ASTM B32, alloy TC (95 percent Tin, 4.85 percent Copper 0.15 percent Selenium), lead free, certified to comply with ANSI/NSF 61.

B. Brazing (Type **CM-B**): AWS A5.8/A5.8M, brazing filler metal classified as BCu4 or BCu5, with minimum melting point of 1300 degrees F. Use wrought fittings for brazing.

C. Do not use connection materials containing lead of any percentage.

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2.4 ACCESSORIES

A. Bolting: Comply with ASTM B98/B98M.

B. Solder: Comply with ASTM B32.

C. Piping Supports:

1. Material: Copper, Brass, or Padded steel.
2. As specified in Section 400507 "Hangers and Supports for Process Piping."
3. Comply with MSS SP-58.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field dimensions are as indicated on Drawings.

B. Inspect existing flanges for nonstandard bolt hole configurations or design and verify that new pipe and flange mate properly.

3.2 PREPARATION

A. Thoroughly clean pipe and fittings before installation.

3.3 INSTALLATION

A. Comply with ASME B31.3.

B. Run piping straight along alignment as indicated on Drawings, with minimum number of joints.

C. Fittings:

1. Clean gasket seats thoroughly, and wipe gaskets clean prior to installation.
2. Install fittings according to manufacturer instructions.
3. Bolts:

a. Tighten progressively, drawing up bolts on opposite sides until bolts are uniformly tight.
b. Use torque wrench to tighten bolts to manufacturer instructions.

D. Provide required upstream and downstream clearances from devices as indicated on Drawings.

E. Install piping with sufficient slopes for venting or draining liquids and condensate to low points.

F. Support exposed piping as specified in Section 400507 "Hangers and Supports for Process Piping."

G. Provide expansion joints as specified in Section 400506 "Couplings, Adapters, and Specials for Process Piping", and pipe guides as specified in Section 400507 "Hangers and Supports for Process Piping", to compensate for pipe expansion due to temperature differences.

H. Dielectric Fittings: Provide between dissimilar metals.

I. Field Cuts: According to pipe manufacturer instructions.

3.4 TOLERANCES

A. Laying Tolerance: 5/8 inch.

3.5 FIELD QUALITY CONTROL

A. Inspection: Inspect for damage to pipe lining or coating and for other defects that may be detrimental as determined by Engineer:

1. Repair damaged piping or provide new, undamaged pipe.
2. After installation, inspect for proper supports and interferences.

B. Pressure Testing:

1. Test Pressure: Not less than 200 psig or 50 psi in excess of maximum static pressure, whichever is greater.
2. Conduct hydrostatic test for minimum two hours.
3. Filling:

    a. Fill section to be tested with water slowly and expel air from piping at high points.
    b. Install corporation cocks at high points.
    c. Close air vents and corporation cocks after air is expelled.
    d. Raise pressure to specified test pressure.

4. Observe joints, fittings, and valves under test.
5. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage and retest.
6. Leakage:

    a. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine if any leakage is present.
    b. Maintain pressure within plus or minus 5 psi of test pressure.
    c. If test of pipe indicates leakage, locate source of leakage, make corrections, and retest until leakage is eliminated.

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3.6 CLEANING

A. Keep pipe interior clean as installation progresses.

B. After installation, clean pipe interior of soil, grit, and other debris.

END OF SECTION 400517

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SECTION 400531 - THERMOPLASTIC PROCESS PIPE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. PVC pipe.
2. PVC Tube.
3. Fittings.
4. Accessories for plastic piping.

B. Related Requirements:

1. Section 400506 "Couplings, Adapters, and Specials for Process Piping": Pipe penetrations, restrained joints, flexible connections, expansion joints and loops, and sleeve-type couplings.
2. Section 400507 "Hangers and Supports for Process Piping": Hangers, anchors, sleeves, and sealing of piping to adjacent structures.

1.3 COORDINATION

A. Section 013100 "Project Management and Coordination": Requirements for coordination.

B. Coordinate Work of this Section with piping and equipment connections specified in other Sections.

1.4 PREINSTALLATION MEETINGS

A. Section 013100 "Project Management and Coordination": Requirements for preinstallation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.5 SUBMITTALS

A. Section 013300 "Submittal Procedures": Requirements for submittals.

B. Product Data: Submit manufacturer's catalog information regarding pipe and fittings.

C. Shop Drawings: Indicate layout of piping systems, including equipment, critical dimensions, sizes, materials lists, location of all fittings, valves, and in-line accessories.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

G. Qualifications Statements:

1. Submit qualifications for manufacturer, installer, and licensed professional.

1.6 CLOSEOUT SUBMITTALS

A. Section 017700 “Closeout Procedures”: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping, valves and other appurtenances, connections, and centerline elevations.

1.7 QUALITY ASSURANCE

A. Permanently mark each length of pipe with manufacturer's name or trademark and indicate conformance to standards.

B. Materials: Certified according to NSF 61.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

B. Installer: Company specializing in performing Work of this Section with minimum three years' experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection:

1. Accept materials on Site in manufacturer's original packaging and inspect for damage.
2. Manufacturer's Packaging: Comply with ASTM D3892.

C. Storage: Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from puncture, abrasion, moisture, dust, and UV by storing in clean, dry location remote from construction operations areas.
2. Protect piping and appurtenances by storing off ground.
3. Provide additional protection according to manufacturer instructions.

1.10 AMBIENT CONDITIONS

A. Section 015000 "Temporary Facilities and Controls": Requirements for ambient condition control facilities for product storage and installation.

B. Minimum and Maximum Temperatures: Do not install pipe when temperature is below 40 degrees F or above 90 degrees F if pipe is exposed to direct sunlight.

C. UV Protection: Provide pipe installed above ground or outside with UV protection.

1.11 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PVC PIPE, TUBE, AND FITTINGS

A. PVC Pipe and Fittings:

1. Pipe and Fittings:

a. Comply with ASTM D1785, Class 12454.
b. Schedule: 80.
c. Fittings: ASTM D2467, Schedule 80, socket.
d. Materials certified according to NSF 61.

B. PVC Tube and Fittings:

1. Tube:

a. Type: Reinforced PVC.
b. Size: As indicated on Drawings.
c. Pressure Rating: 100 psig working pressure at 75° F.

d. Maximum Bend Radius: 8 inches
e. Materials certified according to NSF 61.

2. Fittings:

a. Materials: Suitable for application.
b. Minimum pressure rating equal to or greater than the pipe to which they are joined.

3. Joints: Quick Connect Fittings.

2.2 ACCESSORIES

A. PVC Piping:

1. Solvent Cement:

a. Comply with ASTM D2564.
b. Formulated for use with anhydrous ammonia, aqueous ammonia and other caustic solutions.
c. Primers: Comply with ASTM F656.

2.3 SOURCE QUALITY CONTROL

A. Section 014000 "Quality Requirements: Requirements" for testing, inspection, and analysis.

B. Provide shop inspection and testing of completed pipe sections.

C. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017300 "Execution": Requirements for installation examination.

B. Verify that field dimensions are as indicated on Drawings.

3.2 PREPARATION

A. Section 017300 "Execution": Requirements for installation preparation.

B. Ream pipe and tube ends, remove burrs.

C. Thoroughly clean pipe and fittings before installation.

D. Cleaning: Clean surfaces to remove foreign substances.

3.3 INSTALLATION

A. Comply with ASME B31.3 and B31.9.

B. Run piping straight along alignment as indicated on Drawings.

C. Fittings:

1. According to manufacturer instructions.
2. Gaskets:

    a. Clean seats thoroughly.
    b. Wipe gaskets clean prior to installation.

3. Tighten bolts progressively, drawing up bolts on opposite sides until bolts are uniformly tight; use torque wrench to tighten bolts to manufacturer instructions.

D. Provide required upstream and downstream clearances from devices as indicated.

E. Install piping with sufficient slopes for venting or drainage of liquids and condensate to low points.

F. Support exposed piping as specified in Section 400507 - Hangers and Supports for Process Piping.

G. Provide expansion joints as specified in Section 400506 "Couplings, Adapters, and Specials for Process Piping," and provide pipe guides as specified in Section 400507 "Hangers and Supports for Process Piping," to compensate for pipe expansion due to temperature differences.

H. Field Cuts: According to pipe manufacturer instructions.

I. Joining:

1. Heat Joining: Comply with ASTM D2657:

    a. Butt-fusion joints to be done by a factory-qualified joining technician as designated by the pipe manufacturer.
    b. Field Samples: join two sample welds on each size of pipe to be installed using the same fusion welding equipment that will be used for completion of the entire work. These sample welds will be compared to the manufacturer's sample previously submitted in accordance with Part 1.
    c. Pipe joints with beads in excess of 3/16-in will not be approved by the Engineer.

2. Electrofusion: Comply with ASTM F1290.
3. Primers and Cleaners: Comply with ASTM F402.
4. PVC Solvent-Cemented Joints: Comply with ASTM D2855.

3.4 TOLERANCES

A. Section 014000 "Quality Requirements": Requirements for tolerances.

3.5 FIELD QUALITY CONTROL

A. Section 014000 "Quality Requirements": Requirements for inspecting and testing.

B. Inspection:

1. Inspect for piping defects that may be detrimental as determined by the Engineer.
2. Repair damaged piping, or provide new, undamaged pipe.
3. After installation, inspect for proper supports and interferences.

C. Pressure Testing:

1. Test Pressure: Not less than 150 psig or 1.5 times the system's working pressure, whichever is greater.
2. Conduct hydrostatic test for minimum two hours.
3. Filling:

    a. Fill section to be tested with water slowly and expel air from piping at high points.
    b. Install corporation cocks at high points.
    c. Close air vents and corporation cocks after air is expelled.
    d. Raise pressure to specified test pressure.

4. Observe joints, fittings, and valves under test.
5. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage and retest.
6. Leakage:

    a. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate.
    b. Maintain pressure within plus or minus 5 psi of test pressure.
    c. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
    d. Correct visible leaks and repeat test to verify no leaks at the required test pressures.

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3.6 CLEANING

A. Sections 017300 “Execution” and 017700 “Closeout Procedures”: Requirements for cleaning.

B. Keep pipe interior clean as installation progresses.

C. Clean pipe interior of soil, grit, shavings, and other debris after pipe installation.

END OF SECTION 400531

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SECTION 404113.13 - PROCESS PIPING ELECTRICAL RESISTANCE HEAT TRACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Self-regulating cables.
2. Heat-tracing controls.

1.3 DEFINITIONS

A. Self-Regulating Index (SRI): The rate of change of power output in Watts per degree F, as measured between the temperatures of 50- and 100-degrees F.

1.4 COORDINATION

A. Coordinate Work of this Section with installation of process piping and installation of piping insulation.

1.5 ACTION SUBMITTALS

A. Product Data: Submit manufacturer information for system materials and component equipment, including thermal properties, electrical characteristics, and connection requirements.

B. Shop Drawings:

1. Indicate system materials and component equipment.
2. Submit wiring and control diagrams, installation and anchoring requirements, fasteners, and other details.

1.6 INFORMATIONAL SUBMITTALS

A. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

B. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

C. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

D. Manufacturer Reports: Certify that equipment has been installed according to manufacturer instructions.

1.7 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping and appurtenances receiving heat tracing, and locations of source power and controls.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store materials according to manufacturer instructions.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.10 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

1.11 WARRANTY

A. Furnish five-year manufacturer's warranty for heat tracing and components.

PART 2 - PRODUCTS

2.1 SELF-REGULATING CABLE

A. Manufacturers:

1. Raychem/Pentair Thermal/Chemelex,
2. Chromolox
3. Thermon

B. Description:

1. Bus Wires:

   a. Quantity: Two.
   b. Orientation: Parallel.
   c. Material: Nickel-coated copper.
   d. Minimum Size: 16 gage.

2. Heating Element: Self-regulating polymeric core.
3. Jacketing:

   a. Description: Tinned copper braid with resistance less than cable bus wire resistance.
   b. Comply with ASTM B193.
   c. Insulating Jacket: Polyolefin.

4. Cable Temperature Identification Number (T-Rating):

   a. T6, without use of thermostats.
   b. Comply with NEC.

5. Output:

   a. As indicated on Drawings.
   b. Minimum 5 W/ft..

C. Performance and Design Criteria:

1. Power Output: Vary relative to temperature of surface of pipe or appurtenance.
2. Cable can be cut to length on Site.
3. Minimum SRI:
   a. Cable Rating 5 W/ft.: 0.060 W/degrees F.
   b. Cable Rating 8 W/ft.: 0.074 W/degrees F.
   c. Cable Rating 10 W/ft.:0.100 W/degrees F.

D. Operation:

1. Electrical Characteristics:

   a. As specified in Section 260583 - Wiring Connections.
   b. Voltage: 120 V, single phase, 60 Hz.
   c. Ground-Fault Protection Device: Set at 30 mA, with nominal 100-ms response time, to protect each circuit.

2. Disconnect Switch: Factory mounted in control panel.

E. Accessories:

1. Splicing connectors.
2. End terminations.
3. T-connectors.
4. Power termination kits.

2.2 HEAT-TRACING CONTROLS

A. Control and Monitoring Panel:

1. Materials: Nonmetallic.
2. Rating: NEMA 250 Type 4X.
3. Configuration: Pipe mounted
4. Temperature Controller:

    a. Microprocessor based.
    b. Diagnostic self-testing capability.

5. ON-OFF Control: Soft start.
6. Real-Time Data Indication:

    a. Temperature.
    b. Heater current.
    c. Ground leakage current.

7. Alarms:

    a. HEAT TRACE FAILURE

B. Single Thermostat:

1. Description: Stainless-steel remote bulb with 6-foot capillary encased in flexible stainless-steel armor.
2. Housing:

    a. FM approved.
    b. Rating: NEMA 250 Type 4X.

3. Set-Point Range: 35 to 235 degrees F.

2.3 SOURCE QUALITY CONTROL

A. Testing:

1. Retain at least 75 percent of rated power after 20 years of operation at maximum published continuous exposure temperature.

2. Retain at least 90 percent of rated power after 1,000 hours of operation at maximum published intermittent exposure temperature.
3. Cable Dielectric Test: Passing 2.5 kV dielectric test for one minute according to ASTM D2633 after undergoing a 0.5 kg-m impact.
4. Before shipment, demonstrate cable insulation resistance of 20 megohms minimum bus to braid using a 2,500-V dc megger, and demonstrate tolerance for one minute at voltage equal to twice rated plus 1,000 V applied bus to braid.
5. Thermal Runaway:

    a. Ensure that cable produces less than 0.5 W/ft. when energized and heated to 350 degrees F for 30 minutes.
    b. After testing and reenergizing, demonstrate that cable does not have an increasing power output leading to thermal runaway.

B. Owner Inspection:

1. Make completed heat-tracing assembly available for inspection at manufacturer's factory prior to packaging for shipment.
2. Notify Owner at least seven days before inspection is allowed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces of pipes, valves, and fittings are clean and dry.

B. Verify that piping has been inspected and is ready for insulation.

3.2 INSTALLATION

A. Install heat tracing before insulation is installed.

B. Install equipment according to manufacturer instructions.

C. If required, spiral heat-trace cable around piping to obtain proper heating per length of piping.

D. Do not overlay cable over cable.

E. Cover installed heating cable with thermal insulation and waterproof jacketing as soon as possible.

F. Affix following label to exterior of thermal insulation every 15 feet and readily visible from ground level: CAUTION: ELECTRIC HEAT TRACING.

3.3 FIELD QUALITY CONTROL

A. After installation, inspect for proper operation.

B. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than 1 day on Site for installation, inspection, startup, field testing, and instructing Owner's personnel in operation and maintenance of equipment.

C. Equipment Acceptance:

1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.

D. Furnish installation certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.

3.4 ADJUSTING

A. Check control functions and adjust as required.

3.5 DEMONSTRATION

A. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.

END OF SECTION 404113.13

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SECTION 406100 - PROCESS CONTROL AND ENTERPRISE MANAGEMENT SYSTEMS GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes procurement of the services of a Process Control System Supplier (PCSS) to provide all materials, equipment, labor and services, required to achieve a fully integrated and operational system as specified herein, in "Related Requirements" under this Article, and in related drawings, except for those services and materials specifically noted.

B. Under this contract, the PCSS will also serve as the Applications Engineer System Supplier (AESS) and is responsible for the work defined by Section 406863 "Configuration of HMI Software" and Section 406866 "Configuration of Controller Software."

C. Include auxiliary and accessory devices necessary for system operation or performance, such as transducers, relays, signal amplifiers, intrinsic safety barriers, signal isolators, software, and drivers to interface with existing equipment or equipment provided by others under other Sections of these specifications, whether indicated on the Drawings or not.

D. All equipment and installations to satisfy applicable Federal, State and local codes. Refer to Electrical drawings for area classifications for Class and /Division ratings.

E. Use the equipment, instrument, and loop numbering scheme indicated on the Drawings and in the specifications in the development of the submittals. Do not deviate from or modify the numbering scheme.

F. Configure HMI and controller software in conformance with the City functional design specification and the standards, conventions, and methodologies discussed in the standards and conventions workshop.

G. Related Requirements:

1. Section 406733 "Panel Wiring."
2. Section 406863 "Configuration of HMI Software."
3. Section 406866 "Configuration of Controller Software."
4. Section 463116 "Ammonia Gas Feed Equipment."
5. Section 463126.15 "Emergency Gas Treatment Systems – Chlorine."
6. Section 271313 "Communications Copper Backbone Cabling"

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1.3 DEFINITIONS

A. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

B. Applications Engineering System Supplier (AESS): The entity who provides all programming, configuration, and related services for the control system equipment provided by the PCSS.

C. Maintenance of Plant Operations (MOPO): A construction plan which prevents or limits process disruptions during construction.

1.4 PREINSTALLATION MEETINGS

A. Conduct a project kickoff coordination meeting within two weeks after submitting the Project Plan. The purpose of the meeting is to discuss the PCSS's Project Plan, to summarize the PCSS's understanding of the project; discuss any proposed substitutions or alternatives; schedule testing and delivery deadline dates; provide a forum to coordinate hardware and software related issues; and request any additional information required from the Owner. The meeting will last up to two hours.

B. Conduct a submittal review coordination meeting after the Hardware, Panel Drawing, and Loop Drawing Submittal package has been reviewed by the Engineer and returned to the PCSS. The purpose of this meeting is to review comments made on the submittal package; to refine scheduled deadline dates; coordinate equipment installation activities; and provide a forum for any further required coordination between the PCSS and AESS. The meeting will last up to two hours.

C. Weekly conference call coordination meetings with Engineer, Contractor, and Vendors as required prior to any field start-up or activity testing begins.

D. Schedule the mandatory coordination meetings as described herein. Hold the meetings at the Owner's designated location and include attendance by the Owner, the Engineer, the Contractor, the PCSS's Project Engineer, and the AESS Project Engineer, if applicable. Other Division 40 specifications may require additional meetings. Prepare and distribute an agenda for this meeting a minimum of one week before the scheduled meeting date. Schedule the meeting for a minimum of one week before the requested meeting date.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, mountings, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of control equipment, control panels, and instrumentation as specified herein.
4. Include diagrams for power, signal, and control wiring.

C. Project Plan, Deviation List, and Schedule Submittal:

1. Submit, within 28 calendar days after Notice to Proceed, a Project plan. Submit for approval the Project Plan before further submittals are accepted. The Project Plan to contain the following:

    a. Overview of the proposed control system describing the understanding of the project work, a preliminary system architecture drawing, interfaces to other systems, schedule, startup, and coordination. Include a general discussion of startup, replacement of existing equipment with new, switchover (Maintaining Plant Operations during system transition), approach to testing and training, and other tasks as required by these specifications.
    b. Preliminary list of HMI software, PLC software, and PLC hardware, including version numbers, solely to determine compliance with the requirements of the Contract Documents prior to beginning development of system programming. The review and approval of software and hardware systems as part of this Project Plan stage does not relieve the PCSS of meeting all the functional and performance requirements of the system as specified herein. Substitution of manufacturer or model of these systems after the submittal is approved is not allowed without Engineer's approval.
    c. Project personnel and organization including the PCSS project manager, project engineer, and lead project technicians. Include resumes of each of these individuals and specify in writing their commitment to this project. These do not need to be submitted again if already submitted in the Qualification submittal.
    d. Sample formats of the shop drawings to be submitted and in conformance with the requirements of the Specifications. At a minimum include samples of loop drawings, control system architecture and I/O wiring diagrams.

2. Define Exceptions to the Specifications or Drawings in a Deviation List consisting of a paragraph-by-paragraph review of the Specifications indicating acceptance or any proposed deviations, the reason for exception, the exact nature of the exception and the proposed substitution so that an evaluation may be made by the Engineer. Specifically state if no exceptions are taken to the specifications or drawings. If there is no statement by the PCSS, then it is acknowledged that no exceptions are taken.
3. The PCSS must coordinate their work with the General Contractor's overall schedule. PCSS schedule incorporates all PCSS milestones including but not limited to the following:

a. Schedule for all subsequent project submittals. Include the time required for Contractor's submittal preparation, Engineer's review time, and a minimum of two complete review cycles.
b. Proposed dates for all project coordination meetings.
c. Software purchasing and configuration (following approval of related submittals).
d. Testing: Schedule for all testing.
e. Schedule for system cutover, startup, and/or going on-line for each major system. At a minimum include the schedule for each process controller and HMI server/workstation provided under this Contract.
f. Schedule for all training including submittal and approval of O&M manuals, factory training, and site training.
g. Listing of all major graphics and PLC programs intended to be created or modified for this project. Indicate if graphic or program is new or existing.

4. Component and Wiring Identification and Tagging Plan:

a. All components provided by PCSS require a tag, label, or nameplate. Review specifications and provide a table indicating the tagging and labeling scheme used by the PCSS:

1) Wires and communication cables.

b. Provide detailed information so Engineer can review the following characteristics for each type of tag, label, or nameplate for the different types of components provided above:

1) Size or range of size of the tag, label or nameplate.
2) Font style.
3) Material.
4) Color(s).

D. Input/Output (I/O) List Submittal:

1. Submit, within 60days after Notice to Proceed, a complete system Input/Output (I/O) address list for equipment connected to the control system under this Contract.
2. Base the I/O list on the P&ID's, the Drawings, the design I/O list (if included), and requirements in the Specifications.
3. Submit the I/O list in both a Microsoft Excel readable electronic file format and an 8-1/2 inch by 11-inch hard copy.
4. Reflect all active and spare I/O points on the I/O list. Add points to accommodate spare I/O's as required in the specifications.
5. Arrange the I/O list so that each control panel has a dedicated worksheet, which includes the following information:

a. TAG NUMBER(S): As indicated on the Drawings, the identifier assigned to a device that performs a function in the control system. As part of this information, break out the tag loop number to allow for sorting by loop.

b. DESCRIPTION: A description of the function of the device (text that includes signal source, control function, etc.) Include the text "Spare Points" for all I/O module points that are not connected to equipment.
c. PHYSICAL LOCATION: The Control Panel designation of where the I/O point is wired to.
d. PHYSICAL POINT ADDRESS: Rack, Slot, and Point (or Channel) assignment for each I/O point.
e. I/O TYPE: use DO - Discrete Output, DI - Discrete Input, AO - Analog Output, AI - Analog Input, PI - Pulse Input, or PO - Pulse Output.
f. RANGE/STATE: The range in engineering units corresponding to an analog 4-20 mA signal, or, the state at which the value of the discrete points is "1."
g. ENGINEERING UNITS: The engineering units associated with the Analog I/O.
h. ALARM LIMITS: Include alarm limits based on the control descriptions and the Drawings.
i. P&ID - the P&ID or drawing where the I/O point appears on. Mark as "NA" (Not Applicable) if the I/O point is derived from a specification requirement and is not on the P&IDs.
j. LOGICAL POINT ADDRESS: I/O address of each point.

6. Sort the I/O list in order by:

a. Physical location.
b. I/O Type.
c. Loop Number.
d. Device Tag.

7. Once the I/O list is approved, the PLC I/O addresses are not be modified without approval by the Engineer.

E. Control System Architecture, and Software Packages Submittal:

1. Refer to the sections below for equipment required as part of the Hardware and Software Packages submittal:

a. Section 406800 “HMI System Software.”

2. For each hardware and software packages component specified in the sections above, submit a cover page that lists date, specification number, product name, manufacturer, model number, location(s), and power required. Preferred format for the cover page is ISA-TR20.00.01, general data sheet; however, other formats will be acceptable provided they contain all required information.
3. Complete system architecture drawing(s) showing in schematic form the interconnections between major hardware components including, control panels, computers, networking equipment, control panels with PLC systems and I/O modules, local operator interfaces, process equipment vendor panels with PLCs, and networked peripherals such as power monitors, security cameras, etc. The PCSS is required to provide unique network architecture drawings for the following networks:

a. SCADA

4. Develop the system architecture drawing(s) in accordance with the following information and guidelines:

   a. Show power connections to each piece of equipment or grouping of equipment with voltage and power sources noted such as 120VAC UPS battery, 24VDC battery, or 120VAC from LP (lighting panel). Indicate specific UPS number or circuit number whenever possible.
   b. All communication cable types should be uniquely identified with a specific linetype and cable characteristics clearly indicated in a key or legend located on drawing(s). For example, 50/125-micron multimode mode fiber, or CAT6 Ethernet copper cabling. Any multiconductor communication cables will be clearly labeled above each individual communication with a note added to drawing that states if no quantity exists above a linetype, there is only one communication cable between devices. If a multi-conductor cable has multiple colors, legend to clearly indicate which colors are used for which networks (i.e., a multi-pair fiber optic cable used for dedicated networks such as SCADA, Electrical, Security, HVAC, etc.)
   c. All communication cables need to be assigned a unique cable identification label and shown in either a table or above the communication line.
   d. Identify network protocols for each communication path or for system indicated in a key or legend as appropriate. Examples are Allen-Bradley EtherNet/IP, Modbus TCP/IP, or DNP3.
   e. Indicate which port or connection number the communication cable is terminating at any device that has multiple ports or connection points. For multiple devices, this could be shown once in a key or legend and noted on architecture as appropriate.
   f. For each PLC control panel or network communication enclosure provided by PCSS, the architecture drawing clearly references other drawings provided by the PCSS for detailed panel wiring diagrams with a note near that PLC panel or communication enclosure indicating referenced drawing numbers. A placeholder is acceptable at the time of submission if these drawings are to be submitted at a later date.
   g. Use symbology and/or icons whenever possible to represent a device and differentiate between devices that are different form factors (i.e. tower computer vs. desktop computer vs. rack mounted). Vendor CAD libraries are preferred for symbols.
   h. Develop a diagram that will allow a qualified technician to interconnect all equipment without having to refer to additional manuals or literature.
   i. Use a minimum sheet size of 11"x17" and use of more than one sheet is acceptable with a logical breakout between sheets (i.e., head end on one sheet and plant control system on another). Clearly identify line continuations between drawings.
5. Provide a software schedule or spreadsheet for project which clearly indicates which software packages and operating systems are loaded onto which computers and servers.

F. Panel Layout Drawings and Wiring Diagrams Submittal:

1. Panel Layout Drawings: Submit Drawings for all panels specified. Draw to scale panel assembly and elevation drawings and detail all equipment in or on the panel. Use 11"x17" sheet size for panel drawings and include the following:

   a. Clearly indicate a legend sheet with all symbols used on drawings and with voltage, color and size of each wire and in accordance with requirements of Section 406733 "Panel Wiring."
   b. Interior and exterior panel elevation drawings to scale.
   c. Nameplate schedule.
   d. Conduit access locations.
   e. Panel construction details.
   f. Cabinet assembly and layout drawings to scale. Include a bill of material on the assembly drawing with each panel component clearly defined. Cross-reference the bill of material to the assembly drawing so that a non-technical person can readily identify all components of the assembly by manufacturer and model number.
   g. Fabrication and painting specifications including color (or color samples).
   h. Construction details, NEMA ratings, intrinsically safe barrier information, gas sealing recommendations, purging system details, etc. for panels located in hazardous locations or interfacing to equipment located in hazardous areas.
   i. For every control panel, heating and cooling calculations for each panel supplied indicating conformance with cooling requirements of the supplied equipment and environmental conditions. Include on calculations the recommended type of equipment required for both heating and cooling.
   j. Submit evidence that all control panels are constructed in conformance with UL 508 and bear the UL seal confirming the construction. Specify if UL compliance and seal application accomplished at the fabrication location or by field inspection by UL inspectors. Costs associated with obtaining the UL seal and any inspections are be borne by Contractor.

2. Wiring Diagrams Submittal:

   a. PCSS to provide complete wiring diagrams showing all wiring connections in the I/O system where direct hardwired interfaces exist between the PCSS control panels and vendor provided control panels furnished under other Divisions. This includes but is not limited to terminal block numbering, relay contact information, instruments, equipment, and control panel names. Include drawings in Final O&M submittal. Leaving this information blank on Final Documentation drawings is not acceptable.
   b. Panel wiring diagrams depicting wiring within and on the panel as well as connections to external devices. Panel wiring diagrams include power and signal connections, UPS and normal power sources, all panel ancillary equipment, protective devices, wiring and wire numbers, and terminal blocks and numbering. Field device wiring includes the device ISA-tag and a unique numeric identifier. Diagrams identify all device terminal points that the system connects to, including terminal points where I/O wiring lands on equipment not supplied by the PCSS. Wiring labeling used on the drawings match that shown on the Contract Documents or as developed by the PCSS and approved by the Engineer. I/O wiring numbered with rack number, slot number, and point number. Two-wire and four-

wire equipment to be clearly identified, and power sources noted. Submit final wire numbering scheme. Provide panel drawings that are 11-inch x 17-inch in size.

G. Human Machine/Operator Interface Submittals:

1. Refer to Section 406863 "Configuration of HMI Software" for specific submittal requirements.

H. Controller Program Submittal:

1. Refer to Section 406866 "Configuration of Controller Software" for specific submittal requirements.

I. Testing Plan Submittals:

1. Refer to Section 406121.20 "Process Control System Testing" for specific testing submittal requirements.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For all PCSS supplied hardware to include in operation and maintenance manuals.

1. Submit in accordance with Section 017823 "Operation and Maintenance Data."
2. Include the following information on the operations and maintenance manuals:

a. Table of Contents:

1) Provide a Table of Contents for the entire manual with the specific contents of each volume clearly listed. Include the complete Table of Contents in each volume.

b. Equipment Operations and Maintenance Information:

1) Provide either new documentation written specifically for this project or modified standard vendor documentation to the vendor O&M documentation for each device, piece of equipment, or OEM software. Indicate with arrows or circles all portions that apply to all standard vendor documentation furnished. Neatly line out or cross out all portions that do not apply. Remove groups of pages or sections that do not apply to the specific model supplied.
2) Provide the record documentation of the completed test forms with sign-offs as specified in Section 406121.20 "Process Control System Testing."
3) Include instrument/equipment calibration and configuration forms.

c. As-Built Drawings:

1) Complete as-built drawings, including all drawings and diagrams specified in this section under the "Submittals" section. Include on the drawings all termination points on all equipment the system is connected to, including

terminal points of equipment not supplied by the PCSS. Provide electronic files for all drawings produced. Provide drawings in AutoCAD ".dwg" format and in Adobe Acrobat format. Provide drawings using the AutoCAD eTransmit feature to bind external references, pen/line styles, fonts, and the drawing file into individual zip files.

2) Include on as-built documentation information from submittals, as described in this Specification, updated to reflect the as-built system. Incorporate errors in or modifications to the system resulting from the Factory and/or Functional Acceptance Tests.

B. Operations and Maintenance Data - Software Maintenance Manual

1. Include these manuals as part of "Final System Documentation."
2. Software Listings and Databases – Submit hard copies of the same information required in the "Controller Program Submittal" except include files updated to reflect the as-built system. Include PDF versions of these files on the DVDs specified below.
3. PID Loop Tuning Parameters – Submit annotated chart recorder traces or computer system trend screen printouts showing tuned control loop response to plus and minus 40 percent of full span step changes of loop setpoint for each individual loop. For cascade loops, submit charts showing response of the secondary loop with secondary setpoint on manual and also response of the entire cascade control loop in automatic mode. Include a description of tuning methodology used.
4. Supply hardcopies of configuration information for the HMI systems, reporting systems, Historian Systems, and any other programs developed under this Contract.
5. Machine Readable Documentation – Provide two sets of as-built software documentation on DVDs or USB thumb drives in original electronic format for all PLC, HMI systems, reporting systems, Historian Systems, and any other programs developed under this Contract. Incorporate all changes made during or after testing, start-up, and commissioning.
6. Include final version of the system standards and conventions manual reflecting as-programmed conditions.
7. System Configuration Section:

    a. Include a printout (or screen capture) of all configuration screens for every device requiring PCSS configuration. This includes, but is not limited to, the hardware firewall,, MES', PLC processors, PLC redundancy, EtherNet/IP and any other communication modules, HMI software and other software.

C. Operations and Maintenance Data - Operators' Manual:

1. Provide Operator's Manuals prior to final acceptance of the system.
2. Separately bind and include in the manual all information necessary for the operator to monitor and control the plant from the control system. Write the manuals in non-technical terms and organize for quick access to each detailed description of the operator's procedure. Include the following information:

    a. A comprehensive table of contents of the manual.
    b. A simple overview of the entire system indicating the function and purpose of major control system components described by area or building.

c. A detailed description of the operation of the HMI and OIT including all appropriate displays. Including a screenshot of each HMI and OIT display screen and annotating each function in text is an acceptable format for presenting this information.
d. Step-by-step procedures for starting up or shutting down critical component of the control system such as server or a control panel.
e. Login / logout procedures for the operator interface system(s).
f. Complete, step-by-step procedures for printing reports and entering manual data.
g. Complete, step-by-step procedures for performing system or selected file backup and restoration including archiving historical data. Include recommended archiving schedule for historical data and/or frequency system performs an automatic back-up with a listing of all applications that are backed up or need to be backed up.
h. Operational description for operating HMI computer equipment and peripherals including printers, CD-ROMs, removable bulk storage devices, UPS, etc. Include in the description procedures for typical maintenance and troubleshooting tasks.
i. A complete glossary of terms and definition of acronyms.
j. List of personnel to be contacted for warranty and emergency services, including name, address, telephone number, pager or cell phone number, fax number, and email address.

D. Software and Firmware Operational Documentation:
1. Electronic O&M Information:

a. In addition to the hard copy of O&M data, provide an electronic version of all equipment manuals and data sheets, along with any software back-up of configuration files, on DVD or USB thumb drive. Supply electronic documents in Adobe Acrobat format.
b. Provide electronic files for all custom-developed manuals including training manuals. Supply text in Microsoft Office and Adobe Acrobat formats.
c. Provide electronic files for all drawings produced. Supply drawings in AutoCAD ".dwg" and in Adobe Acrobat formats. Provide drawings using the AutoCAD eTransmit feature to bind external references, pen/line styles, fonts, and the drawing file into individual zip files.
d. Back up each computer system hardware device onto DVD or USB thumb drive after Substantial Completion and turn over to the Owner.

2. Include information as specified in Section 017823 “Operation and Maintenance Data” on the cover and edge of each volume.

1.7 QUALITY ASSURANCE

A. Responsible for the technical supervision of the installation by providing on-site supervision to the installers of the various components.

B. The Process Control System Supplier (PCSS) to be a “systems integrator” regularly engaged in the design and the installation of instrumentation systems and their associated subsystems as they are applied to the municipal water and wastewater industry. For the purposes of this Specification Section, a “systems integrator” means an organization that complies with all of the following criteria:

1. Employs personnel on this project who have successfully completed ISA or manufacturer's training courses on general process instrumentation and configuration and implementation of the specific programmable controllers, computers, and software proposed for this project. Key personnel to hold ISA CCST Level 1 certification or have a minimum of 10 years of verifiable plant startup experience. Key personnel includes, as a minimum, the lead field technician.
2. Has successfully completed work of similar or greater complexity on at least three previous projects within the last five years. Successful completion is defined as a finished project completed on time, without any outstanding claims or litigation involving the PCSS. Potential references for projects where the PCSS's contract was of similar size to this project.
3. Has been actively engaged in the type of work specified in this Section for a minimum of five years.

C. Maintain a permanent, fully staffed and equipped service facility within 60 miles of the project site with full-time employees capable of designing, fabricating, installing, calibrating, and testing the systems specified herein. Respond to on-site problems within 12 hours of notice. Provide an on-site response within four hours of notification starting at two months before scheduled startup to two months after startup completion.

D. The PCSS must be SCADAware, 2023 Eagle Road, Normal, IL 61761:

1. Telephone: (309) 665-0135

E. Being listed in this specification does not relieve any potential PCSS from meeting the qualifications specified in this Section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 016000 "Product Requirements" for delivery, storage, and handling requirements.

1.9 FIELD CONDITIONS

A. Environmental Requirements: Refer to Electrical Drawings for specific environmental and hazardous area classifications.

B. Elevation: Design equipment to operate at the project ground elevation.

C. Temperature:

1. Outdoor area equipment to operate between -4 to 122 degrees F ambient.
2. Equipment in indoor locations operate between 50 to 95 degrees F ambient minimum.
3. Storage temperatures range from 32 to 122 degrees F ambient minimum.
4. Furnish additional cooling or heating if required by the equipment specified herein.
5. Relative Humidity. Air-conditioned area equipment operate between 20 to 95 percent relative, non-condensing humidity. All other equipment operates between 5 to 100 percent relative, condensing humidity.

D. Do not ship control system equipment located in the control room until the control room areas comply with specified ambient temperature and humidity and free of dust and debris.

1.10 WARRANTY

1. Warranty Period: One year from date of Substantial Completion unless noted otherwise in individual specification sections.

PART 2 - PRODUCTS

2.1 GENERAL

A. Electrical Requirements for Control System:

1. Operate equipment on a 60 Hertz alternating current power source at a nominal 120 volts, plus or minus 10 percent, except where specifically noted. Regulators and power supplies required for compliance with the above to be provided between power supply and interconnected instrument loop. Supply constant voltage transformers where equipment requires voltage regulation.
2. With the exception for field device network connected devices, all electronic instrumentation utilize linear transmission signals of isolated 4 to 20 mA DC (milliampere direct current) capable of driving a load up to 750 ohms, unless specified otherwise. However, signals between instruments within the same panel or cabinet may be 1-5 VDC (volts direct current).
3. Outputs of equipment that are not of the standard signals as outlined, have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero-based signals will be allowed.
4. All switches have double-pole, double-throw (DPDT) contacts rated at a minimum of 600 VA, unless noted otherwise.
5. Switches and/or signals indicating an alarm, failure or upset condition wired in a fail-safe manner as shown on the P&IDs**.** A fail-safe condition is when an open circuit generates an alarm state (i.e. contact opens).
6. Materials and equipment UL approved whenever such approved equipment and materials are available.
7. All equipment furnished designed and constructed so that in the event of power interruption, the systems specified all go through an orderly shutdown with no loss of memory and resume normal operation without manual resetting when power is restored, unless otherwise noted.
8. Surge protection requirements for control system power, signal, and communication lines are specified in Section 407856 "Isolators, Intrinsically Safe Barriers, and Surge Suppressors."

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all products or materials before installation. Reject all products or materials that are wet, moisture damaged, or mold damaged.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GENERAL INSTALLATION

A. The shield on each process instrumentation cable to be continuous from source to destination and be grounded at only one ground point for each shield.

3.3 IDENTIFICATION

A. Provide identification system for all PCSS provided hardware, instrumentation, and communication cabling. Provide details as specified in "Project Plan".

3.4 FIELD QUALITY CONTROL

A. Refer to individual hardware and instrument specification sections.

3.5 STARTUP SERVICE

A. Refer to Section 406121.20 "Process Control System Testing."

B. Refer to Section 406126 "Process Control System Training."

C. Weekly on-site coordination meetings with Engineer, Contractor, and Vendors as required during active construction period.

END OF SECTION 406100

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SECTION 406121.20 - PROCESS CONTROL SYSTEM TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes process control system testing, where the Applications Engineering services are performed by the Contractor.

B. Related Requirements:

1. Section 406100 "Process Control and Enterprise Management Systems General Provisions."
2. Section 463116 "Ammonia Gas Feed Equipment."
3. Section 463126.15 "Emergency Gas Treatment Systems – Chlorine."
4. Section 019113 "General Commissioning Requirements."

C. Furnish all labor, materials, equipment and incidentals required to complete the testing of all devices and systems furnished and installed as detailed on Drawings, and as specified herein.

1.3 DEFINITIONS

A. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

B. Applications Engineering System Supplier (AESS): The entity who provides all programming, configuration, and related services for the control system equipment provided by the PCSS.

C. Human Machine Interface (HMI): A software-based user interface with supervisory level control and of machine level equipment.

D. Operator Interface Terminal (OIT): A hardware component of the HMI used for device level control and monitoring.

E. Programmable Logic Controller (PLC): A ruggedized programmable computer used for industrial automation.

F. Input/Output (I/O): Analog or digital field instrument signals to be received and interpreted by a PLC.

G. Uninterruptible Power Supply (UPS): A device capable of providing emergency battery power when the main power source fails.

1.4 ACTION SUBMITTALS

A. Refer to Section 406100 "Process Control and Enterprise Management Systems General Provisions."

B. Testing Submittals - Submit, in one submittal, the following testing related documents:

1. Status signoff forms:

a. Develop and submit project specific I/O Status and Automatic Control Strategy signoff forms to be used during factory and field testing to organize and track each loop's inspection, adjustment, calibration, configuration, and testing status and sign off. Include sign-off forms for each testing phase showing all loops.

1) Example forms are shown in the Appendices.
2) Separate forms for factory and field testing can be used, or they can be combined, at the discretion of the PCSS.
3) Submit testing forms prior to start of testing.

1. Testing Procedures:

a. Submit detailed procedures proposed to be followed for each of the tests specified herein. The test procedures serve as the basis for the execution of the required tests to demonstrate that the system meets and functions as specified. At a minimum, provide the following test procedures:

1) Network and Communications Testing.
2) I/O Testing.
3) UPS.
4) Control panel power, indicators, and hardwired logic tests.

b. Structure documents in an orderly and easy to follow manner to facilitate an efficient and comprehensive test.
c. Indicate in test procedures all pre-testing setup requirements, all required test equipment, and simulation techniques to be used.
d. Structure test procedures in a cause and effect manner where the inputs are indicated, and the outputs are recorded.
e. Include in test procedures the demonstration and validation under normal operating conditions and under various failure scenarios as specified in Contract Documents.
f. Do not start testing until all Testing Submittals have been approved.

C. Test Documentation:

1. Upon completion of each required test, document the test by submitting a copy of the signed off Testing Status forms. Testing is not to be considered complete until the signed-off forms have been submitted and approved. Submittals of other test documentation,

including "highlighted" wiring diagrams with field technician notes, are not acceptable substitutes for the formal test documentation.

1.5 COST OF TRAVEL

A. Scheduled tests will only be attended once by Engineer /Owner. If test is not successful, all subsequent tests will be performed at Contractor's expense. Reimburse Owner for all costs, including labor and expenses, invoiced by Engineer and incurred by Owner for subsequent retests.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TESTING - GENERAL

A. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

B. Track results of all testing on a project specific status sign-off form or similar document. The PCSS is responsible for maintaining the sheet. Appendix of this Section has an example template for this sheet.

C. Tests the PCSS is required to perform are as follows:

1. Field Testing:

a. Operational Readiness Test (ORT).
b. Functional Demonstration Test (FDT).
c. Site Acceptance Test (SAT).

D. Wherever possible, perform tests using actual process variables, equipment, and data. Where it is not practical to test with real process variables, equipment, and data, provide all special testing materials and equipment required for a suitable means of simulation.

E. PCSS to coordinate all required testing with Contractor, affected Subcontractors, Engineer, and Owner.

F. Do not ship equipment to jobsite until Engineer or Owner has received all Factory Testing results and approved the system as ready for shipment.

G. Engineer reserves the right to test or re-test any functions.

H. Correction of Deficiencies:

1. Correct deficiencies in workmanship and/or items not meeting specified testing requirements to meet specification requirements at no additional cost to Owner.
2. Repeat testing, as specified herein, after correction of deficiencies is made until specified requirements are met. Perform work at no additional cost to Owner.

3.2 FIELD TESTING - OPERATIONAL READINESS TEST (ORT)

A. Purpose of ORT is to check that process equipment, instrument installation, instrument calibration, instrument configuration, field wiring, control panels, and all other related system components are ready to monitor and control the processes. This test determines if equipment is ready for operation.

B. This test to take place prior to FDT and startup. Prior to starting this test, install relevant process equipment and mechanically test instruments installed, control panels installed, and field wiring complete.

C. Required Documents for Test:

1. Master copy of the PCSS developed field testing sign-off forms.
2. Testing procedures.
3. Calibration forms.

D. These inspections, calibrations, and tests do not require witnessing. However, Engineer may review and spot-check testing process periodically. All deficiencies found to be corrected by PCSS prior to commencement of Functional Demonstration Test.

E. PCSS to maintain Sign-off forms and Calibration forms at job site and make them available to Engineer/Owner at any time.

F. Perform the following tests as part of ORT:

1. Instrument calibration, configuration, and set-up.
2. Input/Output (I/O) Testing to HMI and OITs.
3. Testing of control strategies.

G. Instrument calibration, configuration, and set-up:

1. Calibrate, configure, and set-up all components and instruments to perform specified functions.
2. Calibration form:

    a. For any component or instrument requiring dip switch settings, calibration, or custom configuration, maintain a calibration form in field documenting this information. These forms provide a summary of the actual settings used in the field to allow an Instrument technician to replace the device entirely and configure it to function as it did before.

b. Add this information to Instrument data sheet and to a copy of manufacturer's standard "Configuration Sheet," or create a separate form.

1) If a separate form, list Project Name, Loop Number, ISA Tag Number, I/O Module Address, Manufacturer, Model Number/Serial Number, Output Range and Calibrated Value.

c. Some examples of required information are:

1) For Discrete Devices: Actual trip points and reset points.
2) For Instruments: Any configuration or calibration settings entered into instrument
3) For Controllers: Mode settings (PID).
4) For I/O Modules: Dip switch settings, module configuration (if not documented in native programming documentation).

d. Maintain a copy of these forms in field during testing and make them available for inspection at any time.

e. For any device that allows a software back-up of configuration files to a laptop, make configuration files available to Engineer/Owner for inspection. Submit as part of Final System Documentation as specified in Section 406100 "Process Control and Enterprise Management Systems General Provisions."

H. I/O Testing:

1. Purpose of I/O testing is to check that process equipment, instrument installation, calibration, configuration, field wiring, and control panels are set-up correctly to monitor and control the processes. This test is commonly referred to as a "loop test" or an I/O checkout.
2. PCSS in conjunction with Contractor to test signals under process conditions. Preferred test method will always be to execute test wherever possible to end elements. For example, preferred test will prove valve open/close limit switches by operating valve, not by installing a jumper on limit switch contacts. However, if equipment or process is not available to test a signal over its entire calibrated range, PCSS may test using a simulation method and make a note on sign-off form.
3. Perform the following I/O tests:

a. Discrete Input: At device or instrument, change signal condition from inactive to active state. Observe results on all indicators within loop such as HMI screens, OIT screens, pilot lights, horns, beacons, etc.

b. Analog Input: Test analog signal over entire engineering range at various intervals including 0, 50%, and 100% as well as on increasing and decreasing range. Observe results on all indicators within loop such as HMI screens, OIT screens, recorders, digital indicators, etc.

c. Test discrete output signals by switching equipment to manual control at the HMI and OIT nodes and turning output on or using other means to turn output on. Then verify equipment responds accordingly.

d. Test analog output signals by switching equipment to manual control at HMI and OIT nodes and turning output on or other means to turn output on. Then verify equipment responds accordingly.

I. Testing of Automatic Control Strategies:

1. Verify all automatic control strategies using actual process equipment and instruments, or other means, to verify logic performs as expected. Verify faults and logical failure scenarios for control strategies such as instrument failures, equipment failures, loss of communication between HMI Server and PLC, loss of peer-to-peer communication, out of range testing for analog inputs, loss of power, and all other strategies specified in control strategy document.

J. Repeat all systems tests specified under factory testing.

K. Test UPS to verify UPS switch power correctly while keeping all UPS powered loads online. Also, test sizing of UPS by switching off-line power to UPS and verify if they maintain specified run time.

L. For all panels with enclosures modified by this Contract, test internal control panel temperature under full running conditions to ensure proper cooling/ventilation is being provided.

M. Upon successful completion of ORT, PCSS to submit a record copy of test results as specified in PART 1 and request scheduling of FDT.

3.3 FIELD TESTING - FUNCTIONAL DEMONSTRATION TEST (FDT)

A. After facility is started-up and running treatment process in automatic control to extent possible, perform a Functional Demonstration Test. Purpose of FDT is to allow Engineer or Owner representatives to witness actual functionality, performance, and stability of system while connected to process equipment.

B. Required Documents for Test:

1. Set of panel drawings and wiring diagrams from ORT with corrections noted.
2. Set of Contract Documents - all drawings and specifications.
3. All design-change related documentation.
4. Signed-off master copy of the PCSS developed field testing signoff forms.
5. Testing procedures.
6. Copy of completed calibration forms.
7. One copy of all O & M Manuals for PCSS supplied equipment.

C. Perform a witnessed FDT on each process area. To extent possible, repeat testing performed during ORT.

D. Follow specified daily schedule during factory tests and FDT.

E. After coordinating with Operations, perform a "Black Start" of the plant to confirm plant operation recovers as specified in Contract Documents. Black start means shutting off power to the plant and turning it back on. Perform separate tests by recovering the plant while on generator (if a generator is specified) and while on utility power.

F. Document punch list items and resolutions noted during test on Punch list/Resolution form. In event of rejection of any part or function test procedure, PCSS to perform repairs, replacement, and/or retest within 10 days.

G. Upon successful completion of the FDT, PCSS to submit a record copy of test results as specified in PART 1.

3.4 FIELD TESTING - SITE ACCEPTANCE TEST (SAT)

A. After completion of FDT, and system is started-up and running treatment process in automatic control to extent possible, perform a test on the system as defined in Section 019113 "General Commissioning Requirements."

B. While this test is proceeding, Engineer and Owner have full use of system. Only allow plant operating personnel to operate equipment associated with live plant processes. Plant operations remain the responsibility of Owner and decision of plant operators regarding plant operations are final.

C. During this test, PCSS personnel to be present as required to address any potential issues that would impact system operation. PCSS is expected to provide personnel for this test who have an intimate knowledge of hardware and software of system. When PCSS personnel are not on-site, PCSS to provide cell phone/pager numbers that Owner personnel can use to ensure that support staff is available by phone and/or on-site within four hours of a request by operations staff.

D. PCSS to analyze and correct any malfunctions during test. In event of rejection of any part or function, PCSS to perform repairs or replacement within 5 days.

E. Throughout duration of SAT, do not make software or hardware modifications to the system without prior approval from Owner or Engineer.

END OF SECTION 406121.20

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APPENDIX **40 61 21-**A: EXAMPLE INPUT/OUTPUT (I/O) STATUS SIGN OFF FORM

An example template for I/O Status signoff form to be used for documenting testing results to Owner is attached. PCSS is required, prior to testing, to create a project specific I/O Status signoff form based on attached template or approved equal. PCSS may obtain an electronic copy of template from Engineer or develop it on their own.

APPENDIX **40 61 21-**B: EXAMPLE AUTOMATIC CONTROL STRATEGIES SIGN OFF FORM

An example template for Automatic Control Strategies signoff form to be used for documenting testing results to Owner is attached. PCSS is required, prior to testing, to create a project specific Automatic Control Strategies signoff form based on attached template or approved equal. PCSS may obtain an electronic copy of template from Engineer or develop it on their own.

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[Project Name] Appendix A - Input/Output (I/O) Status Sign-Off Form

All Sections below are required to be filled out by PCSS as part of Field Testing.
Instrument Alarm Setpoint - Setpoint for any alarms set by PCSS
Wiring Complete - Signal wired from field device to PLC
I/O Tested - Signal tested from field device to SCADA HMI

PLC	Signal Tag	Description	Range or Active State when closed	P&ID	Signal	Rack	Slot	Channel	Instrument Alarm Setpoint	Calibrate, config., and Wiring complete	Date	PCSS I/O testing	Date	I/O Testing to the HMI	Date	Notes
PLC-SC	LIT-4000-1	Secondary Clarifier No. 1 Sludge Level	0-10 ft	8	AI	2	1	0								
PLC-SC	LIT-4010-3	Secondary Clarifier No. 3 Sludge Level	0-10 ft	8	AI	2	1	1								
PLC-SC	SI-4100-1	RAS Pump No. 1 Speed Feedback	0-100%	14	AI	2	1	2								
PLC-SC	SI-4100-4	RAS Pump No. 4 Speed Feedback	0-100%	15	AI	2	1	3								
PLC-SC	FIT-4102-1	RAS Flow Pumps 1-3	0-1900 GPM	14	AI	2	1	4								
PLC-SC	SI-4110-1	WAS Pump No. 1 Speed Feedback	0-100%	14	AI	2	1	5								
PLC-SC	N/A	Spare Slot	N/A	N/A	Spare	2	5	N/A								
PLC-SC	SC-4100-1	RAS Pump No. 1 Speed Setpoint	0-100%	14	AO	2	7	0								
PLC-SC	SC-4100-2	RAS Pump No. 2 Speed Setpoint	0-100%	14	AO	2	7	1								
PLC-SC	SC-4100-3	RAS Pump No. 3 Speed Setpoint	0-100%	14	AO	2	7	2								
PLC-SC	SC-4110-1	WAS Pump No. 1 Speed Setpoint	0-100%	14	AO	2	7	3								
PLC-SC	Spare	Spare	N/A	N/A	AO	2	7	4								
PLC-SC	Spare	Spare	N/A	N/A	AO	2	7	5								
PLC-SC	TSH-4000-1	Secondary Clarifier No. 1 High Temp	Normal	8	DI	3	1	0								
PLC-SC	XA-4000-1	Secondary Clarifier No. 1 Motor Overload	Normal	8	DI	3	1	1								
PLC-SC	WAH-4000-1	Secondary Clarifier No. 1 High Torque	Normal	8	DI	3	1	2								
PLC-SC	WAHH-4000-1	Secondary Clarifier No. 1 High High Torque	Normal	8	DI	3	1	3								
PLC-SC	YRI-4000-1	Secondary Clarifier No. 1 On/Off	On	8	DI	3	1	4								
PLC-SC	YCI-4000-1	Secondary Clarifier No. 1 In Remote	In Remote	8	DI	3	1	5								
PLC-SC	YFI-4100-1	RAS Pump No. 1 VFD Fault	Normal	14	DI	3	1	6								
PLC-SC	FAL-4100-1	RAS Pump No. 1 Low Flow	Normal	14	DI	3	1	7	50 GPM	RJM	12/18/2011	JAS	12/22/2011	MIC	12/29/2011	Example completed line
PLC-SC	Spare	Spare	Normal	14	DI	3	1	8								
PLC-SC	YRI-4100-1	RAS Pump No. 1 Running	Running	14	DI	3	1	9								
PLC-SC	YCI-4100-1	RAS Pump No. 1 In Remote	In Remote	14	DI	3	1	10								
PLC-SC	YFI-4110-1	WAS Pump No. 1 VFD Fault	Normal	14	DI	3	1	11								
PLC-SC	FAL-4110-1	WAS Pump No. 1 Low Flow	Normal	14	DI	3	1	12								
PLC-SC	Spare	Spare	Normal	14	DI	3	1	13								
PLC-SC	YRI-4110-1	WAS Pump No. 1 Running	Running	14	DI	3	1	14								
PLC-SC	YCI-4110-1	WAS Pump No. 1 In Remote	In Remote	14	DI	3	1	15								
PLC-SC	HSS-4000-2	Secondary Clarifier No. 2 Start Command	Start	8	DO	4	6	0								
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	1								
PLC-SC	HSS-4100-2	RAS Pump No. 2 Start Command	Start	14	DO	4	6	2								
PLC-SC	HSS-7000-2	Sludge Holding Tank Blower No. 2 Start Command	Start	17	DO	4	6	3								
PLC-SC	HSS-4100-5	RAS Pump No. 5 Start Command	Start	15	DO	4	6	4								
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	5								
PLC-SC	HSS-4105-1	Secondary Scum Pump No. 2 Start/Stop	Start	15	DO	4	6	6								
PLC-SC	HSS-4110-2	WAS Pump No. 2 Start/Stop Command	Start	15	DO	4	6	7								
PLC-SC	7160-FQI-1	Sludge Loadout LCP Pumping Indicator	Pumping	17	DO	4	6	8								
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	9								
PLC-SC	HSS-7115-2	Sludge Holding Tank Mixer No. 2 Start	Start	17	DO	4	6	10								
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	11								
PLC-SC	HSO-7117-2	Sludge Holding Tank Discharge Valve No. 2 Open CMD	Open	17	DO	4	6	12								
PLC-SC	HSC-7117-2	Sludge Holding Tank Discharge Valve No. 2 Close CMD	Close	17	DO	4	6	13								
PLC-SC	HSS-7120-2	TS Transfer Pump No. 2 Start Command	Start	17	DO	4	6	14								
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	15								

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[Project Name] Appendix B - Automatic Control Strategies Sign-Off Form

All Sections below are required to be filled out by PCSS as part of Testing

Auto. Control Strategies. - Loop operational in Automatic as defined in Control Stategies

Control Strategies Loop #	Control Strategy Description	P&ID	Auto. Control Strategy	Date	Notes
LOOP 281 - 284	LOW FLOW PUMPS	8			
LOOP 290	LOW EQ CHANNEL FLOW NO.4	8			
LOOP 300	MICROFILTRATION AIR SUPPLY LOW PRESSURE	10			
LOOP 351, 352	SITE LIFT STATION PUMP NO.1 AND NO. 2	12			
LOOP 355	SITE LIFT STATION HIGH AND LOW LEVEL CONTROL	12			
LOOP 371, 372	SLUDGE HOLDING TANK NO.1 AND NO. 2 LEVEL	14			
LOOP 381, 382	SLUDGE TRANSFER PUMPS	14			
LOOP 385	SLUDGE TRANSFER PUMPS REMOTE START/STOP COMMAND	14			
LOOP 700	EFFLUENT PUMPING STATION LEVEL	14			
LOOP 701, 702, 703	EFFLUENT PUMP NO.1	14			
LOOP 840	POST AERATION CHANNEL AIR FLOW CONTROL	15			
LOOP 900	SLUDGE TRANSFER PUMPS DISCHARGE FLOW	8			
LOOP 971	CENTRIFUGE SLUDGE FEED PUMP NO.1	8			
LOOP 1001	CENTRIFUGE NO.1 SLUDGE FEED FLOW CONTROL	8			
LOOP 1411, 1412	SODIUM HYPOCHLORITE STORAGE TANKS LEVEL	8			
LOOP 1421, 1422	SODIUM HYPOCHLORITE PUMPS	8			
LOOP 1430	SODIUM HYPOCHLORITE STORAGE TANKS CONTAINMENT AREA HIGH LEVEL DETECTION	14			
LOOP 2051, 2052, 2053	DIESEL ENGINE GENERATOR STATUS	14			
LOOP 2055	TRANSFER SWITCH STATUS	14			
LOOP 2060	GENERATOR KILOWATTS MONITORING	14			
APPENDIX ONE	EQUIPMENT RESTART DURING A POWER LOSS WITH THE GENERATOR RUNNING	14			
APPENDIX TWO	EQUIPMENT RESTART WITH POWER RESTORED AFTER A POWER LOSS	14			
N/A	SELF-HEALING CAPABILITIES OF NETWORK	N/A			
N/A	REDUNDANT SCADA SERVER FAILOVER AND RECOVERY	N/A			

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SECTION 406126 - PROCESS CONTROL SYSTEM TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes process control system training.

B. Related Requirements:

1. Section 406100 "Process Control and Enterprise Management Systems General Provisions."

C. Furnish training as specified herein.

D. This Section covers the training requirements for all devices and systems furnished and installed as detailed on the Drawings.

1.3 ACTION SUBMITTALS

A. Preliminary Training Plan Submittal:

1. Prior to the preparation of the Final Training Plans, submit outlines of each training course including course objectives and target audience, resumes of instructors, prerequisite requirements for each class, and samples of handouts for review.

B. Final Training Plan Submittal:

1. Upon receipt of the Engineer's comments on the preliminary training plan, submit the specific proposed training plan with the following:

a. Definitions, objectives, and target audience of each course.
b. Schedule of training courses including proposed dates, duration and locations of each class.
c. Complete copy of all proposed handouts and training materials bound and logically arranged with all materials reduced to a maximum size of 11 inch by 17 inch, then folded to 8.5 inch by 11 inch for inclusion into the binder.

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1.4 CLOSEOUT SUBMITTALS

A. Refer to Section 406100 "Process Control and Enterprise Management System General Provisions."

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. Directly relate the training and instruction to the system being supplied. The training program represents a comprehensive program covering all aspects of the operation and maintenance of the system.

B. Coordinate all training schedules with and at the convenience of the Owner, including shift training required to correspond to the Owner's working schedule.

C. All onsite instructors must be intimately familiar with the operation and control of the Owner's facilities.

D. Provide detailed training manuals to supplement the training courses including specific details of equipment supplied and operations specific to the project. Provide the manuals in hardcopy for each student. Provide electronic copy of each training manual in PDF format for Owner's future use.

E. Make use of teaching aids, manuals, or slide/video presentations as required. After the training services, deliver all training materials to Owner.

F. The Owner reserves the right to videotape all custom training sessions. All training tapes become the sole property of the Owner.

G. Cost of Travel for off-site training:

1. Cost of Travel for off-site training is paid directly by the entity employing the staff doing the traveling.

3.2 TRAINING SUMMARY

A. Provide the following training courses listed in the summary table below:

Description	Minimum Course Duration (hours)	Maximum Number of Trainees per Course	Number of Times Course to be Given	Intended Audience
Onsite Training				
Control System Overview Seminar	Covered in AESS scope of work			
Operator Control System Training	Covered in AESS scope of work			
Installed Control System	2	2	1	Maintenance, Administrator

B. Definitions of audience roles:

1. Administrator - personnel responsible for maintaining the HMI / SCADA system.
2. Maintenance - personnel responsible for maintaining the field controller hardware and instrumentation system.
3. Operations - personnel responsible for daily plant operations.
4. Management - non-daily operations personnel

3.3 ONSITE TRAINING

A. Training personnel are required to be intimately familiar with the control system equipment, its manipulation, and configuration. Training personnel are required to command knowledge of system debugging, program modification, troubleshooting, maintenance procedure, system operation, and programming, and capable of transferring this knowledge in an orderly fashion to technically oriented personnel.

B. Installed Control System Training:

1. Provide training for the Owner's personnel in the functionality, maintenance, and troubleshooting, of the installed Control System. Conduct the training before the Functional Demonstrator Test (FDT), but not more than two months before.
2. Provide training and instruction specific to the system that is being supplied.
3. Provide training consisting of classroom instructions and hands-on instruction utilizing the Owner's system.
4. Provide detailed training on the actual configuration and implementation for this Contract covering all aspects of the system that will allow the Owner's personnel to maintain, modify, troubleshoot, and develop future additions/deletions to the system. Provide training covering the following subjects:

    a. System overview.
    b. System hardware components and specific equipment arrangements.
    c. Periodic maintenance.
    d. Troubleshooting and diagnosis.
    e. Network configuration, communications, and operation.
    f. TCP/IP addressing procedures for all Ethernet devices.

END OF SECTION 406126

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SECTION 406196 - PROCESS CONTROL DESCRIPTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to Section 406113.

1.2 SUMMARY

A. Section includes Process Control Descriptions.

B. Related Requirements:

1. Section 406100 "Process Control and Enterprise Management Systems General Provisions."
2. Section 463116 "Ammonia Gas Feed Equipment."
3. Section 463126.15 "Emergency Gas Treatment Systems – Chlorine."

C. This Section is provided to clarify the control strategies to be used to program the system.

D. All SCADA System PLC controller programming and SCADA Operator Interface Terminal (OIT) or Operator Workstation Station (OWS) graphics and programming shall be performed as defined in Section 406863 "Configuration of HMI Software" and Section 406866 "Configuration of Controller Software.".

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. The control descriptions are broken into areas. The following is a list of areas and the loop numbers associated with each area.

1.	Chlorine Scrubber (I-3)	150631-150667
	Ammonia Feed System (I-4)	150721-150733

B. The control descriptions are sorted by loop number for each area. The loop index has three columns associated with it; Loop Number, Loop Description, and Page. Each loop is associated with a specific SCADA I/O cabinet location to which it shall communicate.

C. The control descriptions are broken into a hierarchical layer concept. There may be one layer or multiple layers per loop, depending upon that loop. An example of multiple layered loop is as follows. The lowest layer of control, local control, is at that piece of equipment or that piece of equipment's panel or drive. The second layer of control is at an intermediate control panel between the equipment and the SCADA I/O or vendor's PLC I/O. The third layer would be at the vendor's PLC or microprocessor touchscreen station. The highest layer of control is by the SCADA PLC System with its associated operator workstations (OWS) in the main control room, remote office locations, and satellite locations operator interface terminals (OITs). The SCADA PLC/ OWS refers to both the SCADA PLC, which does the actual monitoring and control logic for the process equipment and the SCADA operator workstation (OWS), which are computers that have graphical software that interface to the PLC software for monitoring and implementing all operator-required tasks to control that process equipment. Any functions done in the operator workstations also take place at all the SCADA OITs.

3.2 CONTROL FUNCTION DEFINITIONS AND GENERAL CRITERIA

A. The hardware and/or software functions noted by this paragraph reference are to be implemented by the SCADA PLC/OWS control system specified herein.

B. The following list of ISA abbreviations is typical of those utilized. The description, following the abbreviation, summarizes the basic function to be implemented in the SCADA PLC/OWS software.

1. HS: Represent selector switches or pushbuttons, which shall be implemented by keyboard entry. Function shall be similar to their hardware counterparts. Examples are as follows:

    a. HSH-Open Command.
    b. HSL-Close Command.
    c. HSS-Start/Stop Command.

2. YI: Represents equipment status (i.e., availability, running, in remote, etc.) implemented by a change of color on the OWS symbol for this equipment. For motor driven equipment such as pumps, blowers, compressors, etc., availability contact represents remote operation and no alarm conditions. Examples are as follows:

    a. YCI-Selector switch in computer, auto or remote position.
    b. YRI-Motor running status.
    c. YFI-Motor failure or overload status.
    d. YMI-Selector switch in maintenance position.

3. PAL, AAH, UA, etc.: Represent high or low alarms implemented on the OWS.
4. FIC, PIC, AIC, etc.: Represent PID process controllers implemented in a computer logic algorithm incorporating proportional, integral, and/or derivative modes. Local/remote and manual/auto capabilities shall be provided.
5. FIK, PIK, AIK, etc.: Represent control stations implemented in logic (via keyboard entry and CRT display) to allow downloading of a set point to a FIC, PIC, AIC, etc., and display of the process variable or controller output.

6. FI, PI, AI, etc.: Represent digital output display on the CRT of a process variable in engineering units and/or a dynamic representation of the variable by symbol or graphical means.
7. FIR, PIR, AIR: Represent values stored on the hard disk to provide the data for historical trend graphics of process variables against time (or other selected variables).
8. ZSH, ZSL etc.: Represent high or low, open or close limit positions implemented on the OWS

C. All interlocks that are represented, before the local operational descriptions, or are stated as hardwired interlocks, shall interlock all the controls locally and at the SCADA PLC/OWS or at the vendor PLCs. The SCADA PLC shall be programmed to shut down that equipment if that hardwired interlock is also wired to the SCADA PLC.

D. All interlocks that are represented in a particular layer of the operational descriptions, shall interlock all the controls in that layer and the layer after it. However, the interlock shall not interlock the commands in the layer before it.

E. The SCADA system shall stop a motor or drive in its program if it does not receive the auto or remote status or one of its software interlocks trip. If the drive or motor is in hand or remote it will continue to run but the SCADA start/stop output will be open.

F. All motors that are requested to start by an operator or an automatic program shall alarm if the run confirm status for that motor does not activate within two seconds. If a motor stops by an interlock or stops without any operator or SCADA intervention, then that motor shall go into alarm. All motors that are stopped by a program or the operator shall not go into an alarm.

G. All valves that are requested to open by an operator or an automatic program shall alarm if the open feedback status for that valve does not activate within ten seconds. All valves that are requested to close by an operator or an automatic program shall alarm if the close feedback status for that valve does not activate within ten seconds.

H. Motors that have an H/O/A shall indicate to the operator that the pump is being run in the "Hand" position. A motor is being run in "Hand" when the "Auto" position is not true and the run confirm status is true. If not in "Auto" the SCADA PLC shall open up its output contact to stop (shutdown) the pump from SCADA.

I. All motors or shall be programmed so if a motor stops for any reason, it shall not be re-started automatically once the problem with the motor has been resolved. The start command on the OWS shall not be a maintained contact but a momentary command to the PLC. The run confirms of all motors shall seal in the control output to the motor once the momentary start command drops out. The run confirms shall be on a five second timer delay in that if the run confirm is not present after five seconds, the contact output to the motor from the PLC shall drop out. Thus, the only way a motor can be restarted after five seconds by the SCADA system is if the operator reinitiates the start command for that motor on the OWS or when that motor control at the OWS is placed in complete automatic mode and the SCADA computer through logic/interlocks requests the motor to run.

J. Terminology associated with interlocks is as follows:

1. When a contact or status is true, the SCADA computer will receive power to its input channel. The SCADA computer registers this as a binary bit of one.

2. When a contact or status is false, the SCADA computer will receive no power (open circuit) to its input channel. The SCADA computer registers this as a binary bit of zero.

K. When an analog signal goes outside the 4-20 mA range due to a failure at the instrument or PLC card, the following SCADA programming shall take place:

1. Alarm the signal at any local OITs and in the HMI system.
2. If the analog signal is associated with a control loop or ratio control loop that loop shall go into manual.
3. If the analog signal is used in a calculation, that calculation shall use the last good analog signal. The computer shall place the control loop in manual if using the calculation.

L. Disable all alarms on analog inputs unless specifically called for in the drawings or specifications.

M. All interlocks that shutdown (Stop a piece of equipment and prevent it from being restarted or moved) shall be shown on the faceplate pop-up graphic for that piece of equipment.

N. The run confirms or on status of all motors and lamps shall be accumulated to calculate a run time status of the equipment on the HMI graphic. Each run time accumulation shall come with a reset button on the HMI screen.

O. All flow indications shall be totalized. Do not totalize if the analog signal is outside the 4-20 mA range. Each flow totalization shall come with a reset button on the HMI screen. Do not totalize if the value of the flow input is less than 2% of the full range of the input.

3.3 INDIVIDUAL CONTROL DESCRIPTIONS AND CONTROL SEQUENCES

LOOP INDEX

LOOP No.	**LOOP DESCRIPTION**	**PAGE No.**
LOOP 150631	CHLORINE STORAGE ROOM AMBIENT CHLORINE	5
LOOPS 150651-150667	SCRUBBER SYSTEM	6
LOOP 150721	AMMONIATOR NO. 1	7
LOOP 150722	AMMONIATOR NO. 2	8
LOOP 150723	AMMONIATOR NO. 1 FLOW	8
LOOP 150724	AMMONIATOR NO. 2 FLOW	8
LOOP 150731	AMMONIATOR NO. 1 AMBIENT AMMONIA	8
LOOP 150732	AMMONIATOR NO. 2 AMBIENT AMMONIA	9
LOOP 150733	AMMONIATOR FEED SYSTEM AMBIENT AMMONIA	9

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LOOP 150631 CHLORINE STORAGE ROOM AMBIENT CHLORINE

General: Monitoring of ambient chlorine concentration in the chlorine storage room. The local alarm and indication of the existing chlorine detector will not change. An available 4-20mA output on the existing detector will be used to send an analog signal to the chlorine scrubber PLC. Chlorine concentration warning and leak will be alarmed the chlorine scrubber panel via indicating lights and a horn and strobe.

Control:

Software:

If the high-high (leak) chlorine storage room concentration alarm is activated, the scrubber will start.

If the high (warning) or high-high (leak) chlorine storage room concentration alarm is activated, the horn and strobe on chlorine scrubber panel LCP-150650 will activate.

Local:

None.

SCADA PLC/OWS:

If after a preset time delay, the output of the transmitter is greater than 20mA or less than 4mA, then a Chlorine Sensor Failure Alarm will activate.

Alarms / Monitoring:

Local (LCP-150650):

Chlorine Concentration Indication
High Chlorine Concentration Alarm (Warning)
High High Chlorine Concentration Alarm (Leak)

SCADA PLC/OWS:

Chlorine Concentration Indication
High Chlorine Concentration Alarm (Warning)
High High Chlorine Concentration Alarm (Leak)
Chlorine Sensor Failure

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LOOPS 150651-150667 EMMERGENCY CHLORINE SCRUBBER SYSTEM

General: A vendor packaged scrubber system runs when a chlorine leak level is reached in the storage or chlorinator areas. Scrubber system data will be communicated to SCADA via EtherNet/IP. Refer to Section 463126.15 for additional details on the Emergency Chlorine Scrubber System.

Control:

Hardwired Interlocks:

If the high or high-high chlorine scrubber outlet concentration alarm is activated, the horn and strobe on chlorine scrubber panel LCP-150650 will activate.

Two emergency-stop buttons located outside the chlorine storage room doors will shut down the scrubber.

The scrubber PLC will send a scrubber running signal to the ATC panel.

The ATC panel will send an alarm to the scrubber PLC.

Local (LCP-150650):

The scrubber can be stopped using the E-Stop switch.

The scrubber can be started locally using the Hand-Off-Auto switch. When the switch is in Auto, the scrubber will run based on chlorine concentration from the chlorine storage room chlorine detector.

SCADA PLC/OWS:

Manual: The chlorine scrubber may be started by the operator from SCADA. It may be shut down by the operator from SCADA only if the chlorine warning alarm is not active.

Auto: None

Alarms / Monitoring:

Local (LCP-150650):

Chlorine Storage Room Chlorine Concentration Indication
Chlorine Storage Room High Chlorine Concentration Alarm (Warning)
Chlorine Storage Room High High Chlorine Concentration Alarm (Leak)
Scrubber Outlet Residual Chlorine Indication
Scrubber Outlet Residual Chlorine High Alarm
Scrubber Outlet Residual Chlorine High High Alarm
Scrubber Inlet Pressure (via OIT)
Scrubber Inlet Temperature (via OIT)
Scrubber Running (via OIT)

Scrubber In Auto (via OIT)
Scrubber Fault (via OIT)
Scrubber Low Flow (via OIT)
Scrubber E-Stop (via OIT)
Scrubber Outlet Residual Chlorine (via OIT)
Scrubber Outlet Pressure (via OIT)
Scrubber Outlet Temperature (via OIT)
ATC Alarm (via OIT)

SCADA PLC/OWS:

Scrubber Inlet Pressure
Scrubber Inlet Temperature
Scrubber Running
Scrubber In Auto
Scrubber Fault
Scrubber Low Flow
Scrubber E-Stop
Scrubber Outlet Residual Chlorine
Scrubber Outlet Pressure
Scrubber Outlet Temperature
ATC Alarm

LOOP 150721 AMMONIATOR NO. 1

General: Ammoniator No. 1 is normally flow paced to automatically maintain ammonia dose setpoint. Ammonia feed rate can be set manually at the ammoniator.

Control:

Local:

The ammoniator is designed to automatically control gas feed rate in response to a 4-20 mA signal proportional to plant flow. Refer to Section 463116 "Ammonia Gas Feed Equipment".

SCADA PLC/OWS:

A 4-20mA signal from SCADA proportional to plant flow is used by the ammoniator controller for flow pacing.

Alarms / Monitoring:

SCADA PLC/OWS:

Ammonia Flow Indication
Ammoniator Loss of Vacuum Alarm
Ammoniator Out of Gas Alarm
Ammoniator Running
Ammoniator in Remote

Ammoniator Common Alarm
Ammonia Panel Low Temperature Alarm

LOOP 150722 AMMONIATOR NO. 2

Functionally identical to Loop 150721.

LOOP 150723 AMMONIATOR NO. 1 FLOW

General: Continuous flow measurement by means of a thermal mass flowmeter.

Control:

Local:

None.

SCADA PLC/OWS:

The flow measurement is used as a feedback signal to control ammonia feed rate.

Alarms / Monitoring:

SCADA PLC/OWS:

Flow indication (FI)

LOOP 150724 AMMONIATOR NO. 2 FLOW

Functionally identical to Loop 150723.

LOOP 150731 AMMONIATOR NO. 1 AMBIENT AMMONIA

General: Continuous monitoring of ambient ammonia concentration.

Control:

Local:

None.

SCADA PLC/OWS:

If ammonia concentration is above the high level setpoint, a High Ammonia Concentration alarm will activate.

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Alarms / Monitoring:

Local:

Ammonia Concentration Indication

SCADA PLC/OWS:

Ammonia Concentration Indication
Ammonia Concentration High Alarm

LOOP 150732 AMMONIATOR NO. 2 AMBIENT AMMONIA

Functionally identical to Loop 150731.

LOOP 150733 AMMONIATOR FEED SYSTEM AMBIENT AMMONIA

Functionally identical to Loop 150731.

END OF SECTION 406196

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SECTION 406733 - PANEL WIRING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for internal wiring of control panels and consoles.

B. Related Requirements:

1. Section 406100 "Process Control and Enterprise Management Systems General Provisions" for submittal requirements.

1.3 DEFINITIONS

A. American Wire Gage (AWG): Measurement of the cross-sectional area of a conductor.

B. Input/Output (I/O): Analog or digital field instrument signals to be received and interpreted by a PLC.

C. Programmable Logic Controller (PLC): A ruggedized programmable computer used for industrial automation.

D. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with UL 508.

B. Provide components compatible with functions required to form complete working system.

C. Provide UL 508 label on complete assembly.

D. Maintain one copy of panel drawings on site.

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1.6 FIELD CONDITIONS

A. Refer to Section 406100 "Process Control and Enterprise Management Systems General Provisions."

1.7 WARRANTY

A. Refer to Section 406100 "Process Control and Enterprise Management Systems General Provisions."

PART 2 - PRODUCTS

2.1 CONTROL PANEL - INTERNAL CONSTRUCTION

A. Internal Electrical Wiring:

1. Provide stranded, type MTW interconnecting wiring:

a. Use 600-volt insulation rated for not less than 90 degrees Celsius.
b. Segregate wiring for systems operating at voltages in excess of 120 VAC from other panel wiring:

1) Locate either in a separate section of a multi-section panel or behind a removable Plexiglas or similar dielectric barrier.

c. Develop panel layout such that technicians have complete access to 120 VAC and lower voltage wiring systems without direct exposure to higher voltages.

2. For power distribution wiring on the line side of fuses or breakers:

a. Use 12 AWG minimum.
b. For control wiring on the secondary side of fuses:

1) Use 16 AWG minimum.
2) Utilize 18 AWG shielded, twisted pair cable insulated for not less than 600 volts for electronic analog circuits.

3. Cover power distribution blocks with protective guards to meet "finger-safe" requirements of IP20.
4. Route power and low voltage DC wiring systems in separate wireways.

a. Cross different system wires at right angles.
b. Separate different system wires routed parallel to each other by at least 6-inches.
c. Terminate different wiring systems on separate terminal blocks.
d. Do not fill wiring troughs to more than 60 percent visible fill.

5. Terminations:

   a. Terminate wiring onto single tier terminal blocks:

      1) Uniquely and sequentially number each terminal block.
      2) Direct wiring between field equipment and panel components is not acceptable.
      3) Multi-level terminal blocks or strips are not acceptable.

   b. Arrange terminal blocks in vertical rows and separated into groups (power, AC control, DC signal):

      1) Provide each group of terminal blocks with a minimum of 25 percent spares.

   c. Use compression type, fused, unfused, or switched terminal blocks.

      1) Use two terminals per point for discrete inputs and outputs (DI and DO) with adjacent terminal assignments.
      2) Wire all active and spare PLC and controller points to terminal blocks.

   d. Use three terminals per point for analog inputs and outputs (AI and AO) per shielded pair connection with adjacent terminal assignments for each point:

      1) The third terminal is for shielded ground connection for cable pairs:

         a) Ground the shielded signal cable at the PLC cabinet.
         b) Wire all active and spare PLC and controller points to terminal blocks.

   e. Use sleeve-type wire and tube markers with heat impressed letters and numbers.
   f. Use only one side of a terminal block row for internal wiring:

      1) Field wiring side of the terminal not to be within 6-inches of the side panel or adjacent terminal or within 8-inches of the bottom of free standing panels, or within 3-inches of stanchion mounted panels, or 3-inches of adjacent wireway.

   g. Isolate circuit power from the SCADA cabinet to field devices (switches, dry contacts etc.) that are used as discrete inputs to the PLC input cards with an isolating switch terminal block with flip cover that is supplied with a dummy fuse:

      1) Use Allen Bradley Model 1492-H7 or equal.
      2) One isolating switch terminal block per loop numbered piece of equipment and one per spare I/O point is acceptable.

   h. Isolate all PLC discrete outputs to the field with an isolating fuse switch terminal block with a flip cover and a neon blown fuse indicator:

      1) Use Allen Bradley 1492-H4 or equal.

6. Clearly identify wiring to hand switches and other devices, which are live circuits independent of the panel's normal circuit breaker protection as such.
7. Clearly tag and color code wiring:

    a. Tag numbers and color coding to correspond to panel wiring diagrams and loop drawings prepared by the PCSS.
    b. Power wiring, control wiring, grounding, and DC wiring to utilize different color insulation for each wiring system used.
    c. Color coding scheme to be in accordance with UL 508a.

8. Provide surge protectors on all incoming power supply lines at each panel per requirements of Section 407856 "Isolators, Intrinsic Safety Barriers, and Surge Suppressors."
9. Each field instrument furnished under Division 40 and shown on the Drawings as deriving input power from the control panel(s) to have a separate power distribution circuit with a circuit breaker or fuse and blown fuse indication:

    a. Power instruments requiring 120VAC power as shown on the drawings.

10. Wiring trough for supporting internal wiring:

    a. Plastic type with snap-on covers.
    b. Side walls to be open top type to permit wire changing without disconnecting.
    c. Trough to be supported to the subpanel by stainless steel screws.
    d. Do not bond trough to the panel with glue or adhesives.

11. Provide each panel with a single tube, LED light fixture, 20 Watt in size (minimum):

    a. Mounted internally to the ceiling of the panel.
    b. Light fixture to be switched and be complete with the lamp.

12. Each panel to have a specification grade duplex convenience receptacle with ground fault interrupter:

    a. Mount internally within a stamped steel device box with appropriate cover.
    b. Convenience receptacle is not be powered from a UPS
    c. Protect by a dedicated fuse or circuit breaker.

13. Each panel to be provided with an isolated copper grounding bus for all signal and shield ground connections:

    a. Shield grounding to be in accordance with the instrumentation manufacturer's recommendations.

14. Provide each panel with a separate copper power grounding bus (safety) in accordance with the requirements of the National Electrical Code.
15. Each panel to have control, signal, and communication line surge suppression in accordance with Section 407856 "Isolators, Intrinsic Safety Barriers, and Surge Suppressors."

16. Microprocessor-based electronic devices in the panel that are powered by 120VAC to be powered by the UPS.
17. Provide each panel with a circuit breaker to interrupt incoming power.
18. Additional electrical components including transformers, motor starters, switches, circuit breakers, etc. to be in compliance with the requirements of Division 26.

B. Relays not provided under Division 26 and required for properly completing the control function specified in Division 40, Division 26 or shown on the Drawings to be provided under this Section.

C. Orientation of devices including PLC and I/O when installed to be per the manufacturer's recommendations:

1. No vertical orientation of PLC racks are allowed unless specifically indicated by the manufacturer as an acceptable mounting alternative and also approved by the Engineer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.2 CONNECTIONS

A. Refer to Section 260526 “Grounding and Bonding for Electrical Systems.”

END OF SECTION 406733

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SECTION 406863 - CONFIGURATION OF HMI SOFTWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. If referred to anywhere else in the project manual, AE or AESS services include, but are not limited to, those services specified in this Section.

B. Provide all programming, configuration, and related services required to achieve a fully integrated and operational system. Control of all equipment to be in conformity with the Contract Drawings, process control descriptions, specifications, engineering data, instructions, and recommendations of the equipment manufacturer. Coordinate the control system for proper operation with related equipment and materials furnished by other suppliers under other Sections of these specifications and with related existing equipment. Include the following information:

1. Configuration of the HMI System Software, Operator Interface Terminals, and drivers provided for all equipment shown on the drawings, including equipment provided by vendor package systems.
2. Configuration of any alarm dialer provided.
3. Configuration of the SCADA Historian Software.
4. Communications and functionality data between all connected devices (such as PLCs) and the HMI software packages, including devices supplied by others, as depicted on the system architecture drawings in order to provide a comprehensive working system of data collection, storage and reporting.

C. Coordinate all work with plant operating personnel to minimize impacts on daily operation. Note delays caused for any reason and formally submit to the Engineer and the Owner in the form of a letter.

D. Configure HMI software in conformance with the City functional design specification and the standards, conventions, and methodologies discussed in the standards and conventions workshop.

E. The City is transitioning its SCADA system from iFIX to Ignition. Coordinate with Owner and Engineer regarding which software will be used for this project. Do not begin the system programming and configuration prior to coordinating SCADA software.

F. Related Requirements:

1. Section 406100 "Process Control and Enterprise Management Systems General Provisions" for submittal requirements.
2. Section 406126 "Process Control System Training."
3. Section 406196 "Process Control Descriptions."
4. Section 406866 "Configuration of Controller Software."

1.3 DEFINITIONS

A. Applications Engineering System Supplier (AESS): The entity who provides all programming, configuration, and related services for the control system equipment provided by the PCSS.

B. Human Machine Interface (HMI): A software-based user interface with supervisory level control and of machine level equipment.

C. Input/Output (I/O): Analog or digital field instrument signals to be received and interpreted by a PLC.

D. Operator Interface Terminal (OIT): A hardware component of the HMI used for device level control and monitoring.

E. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

F. Programmable Logic Controller (PLC): A ruggedized programmable computer used for industrial automation.

1.4 PREINSTALLATION MEETINGS

A. Refer to Section 406100 "Process Control and Enterprise Management Systems General Provisions." The meetings below are in addition to the meetings specified in that section.

B. Schedule and conduct a standards and conventions workshop. The purpose of this workshop is to review the standards, conventions, and methodologies that will be used to program and develop the programs (i.e., HMI and PLC databases, HMI graphics, and PLC programming, etc.) and will solicit Engineer and Owner's input. Submit an agenda with examples for items to be discussed at client workshop.

C. Schedule and conduct a draft graphics review meeting. The purpose of this meeting is to present draft graphics for the Owner's and Engineer's review and feedback prior to creating the full set of graphics for review. For repetitive graphics such as graphics for multiple process trains, include an example of the first graphic only for discussion. Include discussion of process and overview displays, examples of pop-ups, trends, and system navigation tools. Expect major comments and incorporate any changes resulting from those comments.

D. Schedule and conduct a historical data management and reports workshop. The purpose of this workshop is to discuss and solicit Engineer/Owner input for storage and management of historical data; format of daily, monthly, and yearly reports; development of data entry

templates; report formats and layouts; and user interface displays for accessing and generating reports. Bring examples of these documents for review and discussion.

E. Schedule and conduct a field-testing coordination meeting, two weeks prior to field testing. The purpose of this meeting is to discuss specifics of proposed tests and provide a forum for coordinating required field-testing.

1.5 ACTION SUBMITTALS

A. Provide all required submittals in accordance with Section 013300 "Submittal Procedures." Provide the submittals listed below at a minimum:

1. System Standards and Conventions.
2. Operator Interface.
3. Controller Program.
4. Historical Data Management.

B. System Standards and Conventions Submittal:

1. Following the standards and conventions workshop, submit standards and conventions to be used on this project. Define the submittal, at a minimum:

   a. Graphic display standards, including color conventions, equipment symbols, display format, equipment control pop-up displays, trend displays, and display navigation. Include samples of each proposed type of graphic display (i.e., overview, detail, diagnostic, tabular, etc.).
   b. System naming conventions, such as graphic displays naming, database naming, tag names, and computer naming.
   c. System configuration, including network addressing and PLC/RTU addressing.
   d. Alarm configuration standards, including priorities and logging.
   e. Security configuration standards, including user groups and privileges.
   f. PLC/RTU standard programming modules, including analog input scaling, flow totalization, equipment runtime, motor start/stop, valve open/close, and any other standard logic planned to be used.

2. To facilitate the Owner's future operation and maintenance, use the submitted standards and conventions as basis for programming and configuration of the system. Do not begin the system programming and configuration prior to the System Standards and Conventions Submittal.

C. Operator Interface:

1. Following the approval of the standards and conventions submittal, submit a draft of all proposed graphic displays, examples of each type of pop-up (faceplate) displays, and examples of trends. For those graphics, which will be duplicated more than once for similar type of equipment, submit graphics for the first equipment only.
2. Following the draft graphics review meeting and prior to the factory test, submit a ready-for testing version of all graphic displays. These graphics should be completely finished other than the incorporation of comments and changes resulting from testing.

3. Submitted graphic displays and trends are to be no less than 8.5 inches by 11 inches and in full color.

D. Historical Data Management:

1. Following the Historical Workshop, submit all aspects of the historical data management system and include as a minimum the following:

a. A complete listing of all signals to be collected and stored, including data sampling rate and duration for which the data will be immediately accessible.
b. Data reduction methods, rates, and the duration data will be immediately accessible.
c. Storage space requirements and supporting calculations.
d. Historical database design description, including data flow diagram, table definitions, procedures and queries used; and description of method of accumulating and displaying run times and flow totals. Define the method of interfacing to the reporting system, methods of handling Data Quality Flags, and methods of storing and displaying trending information.
e. Description of methodology for restoring data collected locally during times when the historical data management system is not available. Description of database failure and recovery, including data correction.
f. Description of selecting only the active real-time data source for systems that are utilizing redundant data acquisition nodes.
g. List of data source interfaces to be used with the system (for example, OPC, file collection, historian-historian collector, HMI applications, etc.)

1.6 INFORMATIONAL SUBMITTALS

A. Refer to Section 406100 "Process Control and Enterprise Management Systems General Provisions."

1.7 CLOSEOUT SUBMITTALS

A. Refer to Section 406100 "Process Control and Enterprise Management Systems General Provisions."

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. The system specified performs the following generalized functions:

1. Allows the operator to control equipment such as pumps and valves as shown on the Drawings and as defined in Section 406196 "Process Control Descriptions."

2. Perform real-time process control, including proportional integral derivative control action, sequencing, and process calculations.
3. Collect, calculate, and store accurate, reliable operating information for present and future uses.
4. Assist remote site operating personnel by noting and communicating of normal operating conditions and equipment failures.
5. Accumulate and store equipment running times for use in preventative maintenance.
6. Provide color graphic displays and reports for use by the system operating and supervisory personnel.
7. Provide trending for analog values.
8. Provide control system diagnostics.
9. Perform process control functions including PID, calculations, sequencing, timing, in the process controller. The HMI software performs the real-time database, report generation, graphic screens, program development, set point modification, data archiving, etc.
10. Allow the operator to manually control (by keyboard entry and mouse type pointing device) the status of pumps, valves, e.g., on/off, open/close, setpoint value,) when viewing the appropriate graphic screen on the HMI.

3.2 GRAPHIC DISPLAYS - GENERAL

A. Ensure displays contain and continuously update the displayed process variables, date and time of day, with process values showing in engineering units. Incorporate on displays:

1. References to both instrumentation tag numbers and plant equipment numbers.
2. Process variables on their associated display(s) with correct engineering units.
3. Process variables with their associated data quality flags.

B. Operator commands related to controlling field devices or system attributes require multiple keystrokes or mouse actions to protect against inadvertent operations. Confirmation to the operator for the selected point to be controlled is provided, at which time a cancellation of the control can be affected.

C. Process graphic displays are depicted from the P&ID's, site plan drawings, mechanical drawings and electrical drawings included in these Contract Documents. The graphic displays include process flow streams, process structures, and all major items of process equipment and control devices in a schematic format.

D. Include on main graphical screens a title bar, main graphic area, navigational buttons, and alarm summary bar:

1. Title bar displayed on the top of each screen and include display name, description and time/date.
2. Main graphical area contains primary screen data in graphical format.
3. Navigational buttons include a minimum of main menu, trends, main alarm summary, and security log in.
4. Alarm summary bar displays the last three valid alarms on the bottom of each screen.

E. Provide animation to mimic level changes in tanks or vessels, and to mimic rotation of rotating equipment when running. Valve colors to change when opened and closed.

F. Adjust from the operator interface timers, setpoints, alarm actuation levels, unless specifically noted.

G. Ensure the system show field conditions with text that can alternate (i.e., OPEN/CLOSE, START/STOP, HIGH/LOW) and change color correspondingly. Field devices that are tri-state must be represented in three conditions.

H. Ensure conditions in the field designated as alarm conditions report to the operator workstation, actuate an audible alarm, and provide a visual blinking image on the associated graphic page. Display alarms and events on the screen and archived.

I. Identify interlocks that affect equipment operation both by alarm and by HMI indication.

J. Check analog inputs for out of range (via high and low limit checks) and alarmed.

K. Label process flow streams and color-code in accordance with the City's functional design specification and as discussed in the standards and conventions workshop. Identify structures and equipment by name and appropriate equipment and loop tags.

L. Color coding for equipment status and alarms is in accordance with the City's functional design specification and as discussed in the standards and conventions workshop.

M. Automatically record alarm and events should any of the following sequences or events occur:

1. Date/Time entry.
2. Limit changes.
3. Commanded or un-commanded change of any point.
4. Alarm conditions.
5. PLC activation or deactivation.
6. Operator login or logout activity.

N. There may be additional general programming requirements listed in Part 1 of the Section 406196 "Process Control Descriptions" that impact the HMI configuration.

3.3 SPECIFIC GRAPHIC SCREENS

A. At a minimum, provide the following types of graphic screen indicated below.

1. Chlorine Scrubber System
2. Ammonia Feed System

B. Update existing graphics as appropriate to display new systems and components:

1. Plant Overview screen including a site plan representation, indicating the geographic location of each process and building.
2. Main menu screen linking all screens and process areas; complete and logical listing names and number of all screens.
3. Overall plant process block flow diagram screen showing major processes in block form with flow arrows. Each block includes a text description of key individual treatment

processes. Navigational buttons to the individual treatment processes can be performed by pressing on the text description.

4. Individual treatment process screens graphically screening key process variables and equipment. Features:

    a. No operator entries are available from these screens.
    b. Individual process flow screens for each process include all process components, including tanks, pumps, blowers, mixers, drives, flow meters, valves, mechanical devices, as well as manual shutoff and isolation valves.
    c. These diagrams are generally depicted from the P&ID's with at least 1 screen per P&ID on average.

5. Individual unit process screens depicted from the P&ID's are used for control and screen of each major item of process equipment, process variables, and control devices, including pumps, blowers, valves, gates, mixers, and drives. Navigational buttons consist of the P&ID's flow arrows to other individual unit processes. The unit process screens provide the ability for the operator to go to individual equipment popup screens. These diagrams are generally depicted from the P&ID's with at least 2 screens per P&ID on average.
6. Provide popup screens for each piece of equipment to start/stop equipment, open / close valves, implement automatic control, adjust set points, establish and adjust tuning parameters, set alarm limits and initiate a sequence.
7. PLC system diagnostic screens, showing the operational status, and fault conditions of all PLC components, including processors, I/O modules, OIT's, power supplies and UPS units.
8. Communications diagnostic screens, showing the details of network status, communications status of all major components including Operator Work Stations, peripheral devices and network components.
9. Maintenance screens display the raw value for each analog and digital I/O point in the system. They allow the operators/maintenance personnel to enter an override value for an analog point that is then used by the system instead of the value read from the input card / communications link.
10. Trend screens with the capability to screen up to eight, operator assigned, analog and/or digital process variables. Each analog value will be shown on a trend screen.
11. Main alarm summary screen includes the following information for each alarm: Time, tag name, description, alarm type, current value and status. An acknowledge alarm button acknowledges all new unacknowledged alarms. Display alarms in the alarm summary screen and in the alarm banner as follows:

    a. Unacknowledged and active alarm: Displayed on screen, blinking
    b. Acknowledged and active alarm: Displayed on screen, not blinking.
    c. Unacknowledged and inactive alarm: Displayed on screen, blinking. Text/background of the alarm displayed in a different color than active alarms.
    d. Acknowledged and inactive alarm: Not displayed in banner.

12. Analog variable screens showing a tabular summary of all plant process variables, in operator assigned groupings.

3.4 SECURITY

A. Coordinate with Owner's existing security configuration and user account information, including login name and password for each account.

3.5 ALARM/EQUIPMENT STATUS REPORTING

A. Display on the alarm log all alarms as they occur. Include on the alarm message the time of occurrence, tag name, tag number, and whether it is a low, high, or failure alarm. When the point in alarm returns to normal, the time, point identification number, and return to normal are displayed. Include on all reports the plant equipment number of the associated device.

B. Log the equipment status whenever a change in status occurs (i.e., start, stop). Include on the equipment status log the time, equipment name, tag number, and the particular change in status.

3.6 HISTORICAL DATA MANAGEMENT

A. Provide the following features for processing and storage of system historical data:

1. Each system point (analog or digital, real or pseudo) has the capability of being historically logged. A point can be deleted from historical log at any time. Points can be added or deleted from the system using minimal keystrokes.
2. Sample and store all process analogs and all flow totals and run time indications of all primary process equipment motors in the historical data management system.
3. Data Processing: Store the real time instantaneous values in a historical log file on the hard disk at defined sampling rates.
4. Data Correction: Manually modify historical data by personnel with appropriate security levels. Differentiate such data from actual monitored values on reports, in the database and in trends.
5. Data Quality: Propagate data Quality flags to the next higher level of the history based on user selectable percentage determining tolerance levels for averages and totals. If the percentage of suspect data exceeds the tolerance level, the suspect data flag propagates to the next higher level. Maximums and minimums are taken from good data.
6. Manual Input Data Handling: This data consists of additional values not obtainable by the system such as laboratory analysis for use in reports. Enter and store all manually entered data in the appropriate engineering units. Display all data entered for confirmation on the display prior to incorporation to the database.

3.7 TESTING

A. Refer to Section 406121.20 "Process Control System Testing."

B. Supplement to Field Testing requirements

1. Prior to leaving the site, use the Owner's programming computer to monitor all PLC processors online, make on-line changes, upload and download the processor to ensure programming software version compatibility.
2. Loop Tuning – Tune all PID control loops (single or cascade) following device installation but prior to commencement of the Functional Demonstration Test:

a. Achieve optimal loop tuning either by auto-tuning software or manually by trial and error, Ziegler-Nichols step-response method, or other documented process tuning method.
b. Determine and configure optimal tuning parameters to assure stable, steady state operation of final control elements running under the control PID. Adjust each control loop that includes anti-reset windup features to provide optimum response following startup from an integral action saturation condition.
c. Tune all PID control loops to eliminate excessive oscillating final control elements. Adjust loop parameters to achieve a decay ratio of 1/4 or better. In addition, achieve loop steady state at least as fast as the loop response time associated with critical damping.
d. Verify loop performance and stability by step changes to setpoint in the field.
e. Submit loop tuning documentation as specified in Part 1 of this Section.

3.8 TRAINING

A. Refer to Section 406126 "Process Control System Training" for general training requirements

B. Furnish training as shown in the table below.

Description	Minimum Course Duration (hours)	Maximum Number of Trainees per Course	Number of Times Course to be Given	Intended Audience
Onsite Training				
Control System Overview Seminar	2	6	1	Management
Operator Training (Pre start-up)	2	6	1	Operations
Operator Training (Post start-up)	2	6	1	Operations

C. Control System Overview Seminar:

1. Provide Control System Overview seminar for the Owner's personnel at the Owner's facility. The objective of this seminar is to provide personnel with an overview understanding of the Control System. Target the seminar material to the Owner's management, engineering, and other non-operations personnel. The seminar includes, but not limited to, the following:

a. An overview of the Control system explaining how the hardware and software supplied under this Contract is used for the operation and control of the facilities.
b. A block diagram presentation of the Control system showing how and what information flow within the system and what each functional unit does.
c. An explanation of the operator interfaces including a demonstration of how to use an operator's workstation to monitor, control, navigate, display trends, and all other operational features of the system. Address outside of this course a discussion of process control of individual processes.
d. A walkthrough of the installed system explaining each of the items covered in the functional units' discussion. Discuss the features and functions of operator controls and interfaces.

D. Operator Control System Training (pre- or post start-up):

1. Cover during operator training plant operation with the control system and use of the HMI display screens, including at a minimum all the following items:

   a. Basics of HMI control and navigation.
   b. Alarming and Interlocks.
   c. Auto functionality of automated processes and HMI control.
   d. Failure modes of equipment and operator responses.

2. Hold a minimum of two operator-training sessions (Pre-Startup) for operators one week before system startup. Use the Simulator specified in this project for the pre-startup training. Hold additional one or two operator-training sessions (Post-Startup) for operators one week after system startup.
3. Hold operator training at the convenience of the Owner. Hold this training during the day, late at night, or very early in the morning to accommodate the Owner's shift schedule.
4. Operator training is introductory in nature during pre-startup training and more in-depth and detailed during post-startup training.
5. At a minimum, provide the following teaching aids for distribution during Operator training sessions:

   a. Preliminary O&M Manuals (pre-startup); Final O&M Manuals (post-startup).
   b. P&IDs.
   c. Daily syllabus.

6. Fifty percent of the Operator training is "hands on" utilizing the installed Control System to the fullest extent possible. Confirm the operability of the Control System before commencing training. Training performed using a non-functioning Control System is not permitted.

END OF SECTION 406863

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SECTION 406866 - CONFIGURATION OF CONTROLLER SOFTWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. If referred to anywhere else in the project manual, AE or AESS services include, but are not limited to, those services specified in this Section.

B. Provide all programming, configuration, and related services required to achieve a fully integrated and operational system. Control all equipment in full conformity with the Contract Drawings, process control descriptions, specifications, engineering data, instructions, and recommendations of the equipment manufacturer. Coordinate the control system for proper operation with related equipment and materials furnished by other suppliers under other Sections of these specifications and with related existing equipment:

1. Provide configuration of the PLC provided for all equipment shown on the drawings, except for controls equipment shown being provided as part of a vendor package system.

C. Coordinate all work with plant operating personnel to minimize impacts on daily operation. Note delays caused for any reason and formally submitted to the Engineer and the Owner in the form of a letter.

D. Configure controller software in conformance with the City functional design specification and the standards, conventions, and methodologies discussed in the standards and conventions workshop.

E. Related Requirements:

1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.
2. Section 406196 “Process Control Descriptions.”
3. Section 406863 “Configuration of HMI Software.”

1.3 DEFINITIONS

A. Applications Engineering System Supplier (AESS): The entity who provides all programming, configuration, and related services for the control system equipment provided by the PCSS.

B. Human Machine Interface (HMI): A software-based user interface with supervisory level control and of machine level equipment.

C. Input/Output (I/O): Analog or digital field instrument signals to be received and interpreted by a PLC.

D. Operator Interface Terminal (OIT): A hardware component of the HMI used for device level control and monitoring.

E. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

F. Programmable Logic Controller (PLC): A ruggedized programmable computer used for industrial automation.

1.4 PREINSTALLATION MEETINGS

A. Refer to Section 406100 "Process Control and Enterprise Management Systems General Provisions." The meetings below are in addition to the meetings specified in that section.

B. Refer to Section 406863 "Configuration of HMI Software" for requirements of the standards and conventions workshop.

1.5 ACTION SUBMITTALS

A. Controller Program Submittal:

1. For each controller, submit the following using the controller manufacturer's built in printing functions. Electronic submission of Adobe Portable Document Format ("pdf") files in lieu of paper submittals is acceptable. Review will be for general program organization, level of documentation, and overall programming standards (basic pump and valve control, for example). The review will not attempt to confirm the logic works correctly for every loop:

    a. PLC programs showing ladder logic, function block, high level language or another controller language used. Include individual rung, network, and/or command descriptions with abundant comments to clearly identify function and intent of each code segment. Clearly present each logic segment, describe the function of each timer, label and define the purpose of each subroutine call, etc. Ensure that program documentation is sufficiently clear to allow determination of compliance with the process control requirements included in the control descriptions and with the Drawings. The submittal demonstrates that all logic provided under this project follows the same structure and format and reflects a common programming approach.
    b. Submit a memory usage report for the controller. Indicate total memory capacity and unused memory capacity.
    c. Submit cross reference index of I/O allocation and controller memory address. Include every physical I/O point as well calculated or virtual I/O required for the implementation of the process scheme.

2. Submit details of control system communication. Submit a "memory map" or other means showing which signals are exchanged between PLCs. Also submit an HMI tag database showing all signals exchanged between the PLCs and HMI. Define any specific communication block memory addresses.

B. Submit all electronic files associated with the controller such that the Owner and Engineer can open a complete copy of the controller program using the controllers native programming package.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONTROLLER PROGRAMS

A. Develop all application programs in a structured manner and follow an intuitive arrangement so that an instrumentation technician with basic programming knowledge will be able to understand. Utilize standard program templates or subroutines for repetitive logic such as equipment control, flow total calculations, equipment runtime calculations.

B. Make changes to the application programs and software configuration, based on comments during the submittals, the factory tests, the field tests, and during the commissioning process to meet the design intent, at no additional cost to the Owner.

END OF SECTION 406866

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SECTION 407856 - ISOLATORS, INTRINSICALLY SAFE BARRIERS, AND SURGE SUPPRESSORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes isolators, intrinsically safe barriers, and surge suppressors.

B. Related Requirements:

1. Section 406100 "Process Control and Enterprise Management Systems General Provisions" for submittal requirements.
2. Section 406733 "Panel Wiring."

1.3 DEFINITIONS

A. Section 4072XX "Sections for level measurement": The XX in the number indicates all spec sections starting with the first 4 numbers (indicating a category described in the accompanying text) are included in the reference.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Refer to Section 406100 "Process Control and Enterprise Management Systems General Provisions"

B. Shop Drawings:

1. Refer to Section 406100 "Process Control and Enterprise Management Systems General Provisions"

1.5 INFORMATIONAL SUBMITTALS

A. Refer to Section 406100 "Process Control and Enterprise Management Systems General Provisions" for any PCSS requirements regarding informational submittals for instruments.

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1.6 CLOSEOUT SUBMITTALS

A. Refer to Section 406100 "Process Control and Enterprise Management System General Provisions."

1.7 QUALITY ASSURANCE

A. Provide components compatible with functions required to form complete working system.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 016000 "Product Requirements" for delivery, storage, and handling requirements.

1.9 FIELD CONDITIONS

A. Refer to Section 406100 "Process Control and Enterprise Management Systems General Provisions."

1.10 WARRANTY

A. Refer to Section 406100 "Process Control and Enterprise Management Systems General Provisions."

PART 2 - PRODUCTS

2.1 SURGE PROTECTION FOR CONTROL SYSTEMS

A. Manufacturers:

1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:

a. Citel DLA series
b. MJ8 series,
c. MTL Surge Technologies (Telematic) NP Series,
d. Phoenix Contact PlugTrab Series,
e. Transtector FSP Series,
f. Substitutions: Or equal

B. Function/Performance:

1. Provides surge protection of electronic instrumentation from induced surges propagated along the signal and power supply lines from lightning, utility, or the plan electrical systems.

2. Protection system lower than the instrument withstand level, while not interfering with normal operation.
3. Maintenance free and self-restoring.
4. Response time: Less than 50 nanoseconds.
5. Discharge surge current: At least 8kA (at an 8x20μs impulse waveform)

C. Required Surge Protection:

1. Analog Signal (4-20mA) Circuits:

   a. Provide surge protection where any part of the circuit is outside of the building envelope.
   b. Protect circuits at both the transmitter and the control system end of the circuit.
   c. Mount transmitter surge protectors in separate NEMA 4X enclosure or conduit mount.
   d. Use of a single device to protect both 120VAC and 4-20mA wires is acceptable.
   e. Provide surge protector from one of the following:

      1) Phoenix Contact PT Series
      2) MTL Surge Technologies (Telematic) TP48
      3) Citel DLA or CAD series.
      4) Substitutions: Or equal.

2. Control Panel Power Feed (120VAC):

   a. Provide protection of 120VAC power feed into control panels, instruments, and control room equipment.
   b. Provide surge protector from one of the following:

      1) Citel DS40 series
      2) MCG Surge Protection 400 Series
      3) Phoenix Contact "Mains-PlugTrab"
      4) Transtector ACP-100BW Series
      5) Substitutions: Or equal.

3. Non-Fiber Based Data Highway or Communications Circuits:

   a. Provide protection on all communication and data highway circuits that leave a building or are routed external to a building.
   b. Provide circuit protection at both ends of the line.
   c. Provide surge protector from one of the following:

      1) Phoenix Contact PlugTrab Series,
      2) Transtector FSP Series,
      3) MTL Surge Technologies (Telematic) NP Series,
      4) Citel DLA series
      5) MJ8 series,
      6) Substitutions: Or equal.

4. Inductive Loads:

a. Provide coil surge suppression devices, such as varistors or interposing relays, on all process controller outputs or switches rated 120VA or less that drive solenoid, coil, or motor loads.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, roofs, and rooms for suitable conditions where equipment will be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.3 CONNECTIONS

A. Refer to Section 260526 “Grounding and Bonding for Electrical Systems.”

3.4 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 407856

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SECTION 463116 - AMMONIA GAS FEED EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Furnish all labor, materials, equipment and incidentals required and install complete, ready for operation and field test the ammonia gas feed systems as shown on the Drawings and as specified herein.

B. Vacuum operated, solution feed, fully automatic-type ammoniation controls for producing and feeding ammonia solution to the following locations:

1. High Service Pump Wetwell.

C. Ammoniation system to be installed in new ammonia feed panels to be installed exterior to building adjacent to the existing Filter Room.

D. Related Requirements:

1. Electrical work, except as specified herein, is included in Division 26.
2. Section 400531 "Thermoplastic Process Pipe" for PVC pipe.
3. Section 400551 "Common Requirements for Process Valves" for valves except as specified in this Section.
4. Steel pipe, except as specified herein, is included in Division 40.
5. Valves and piping appurtenances, except as specified herein are included in Division 40.

1.3 COORDINATION

A. Section 013100 "Project Management and Coordination" for coordination requirements.

B. Coordinate Work of this Section with Owner.

1.4 PREINSTALLATION MEETINGS

A. Section 013100 "Project Management and Coordination" for preinstallation meeting requirements.

B. Convene minimum two weeks prior to commencing Work of this Section.

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1.5 SCHEDULING

A. Section 013100 "Project Management and Coordination" and Section 013200 "Construction Progress Documentation: for scheduling requirements.

B. Schedule Work of this Section after finishing concrete work for support pad and prior to connecting piping work.

1.6 SEQUENCING

A. Section 011000 "Summary" for sequencing requirements.

B. Sequence Work to prevent interference with operation of the water treatment plant.

1.7 ACTION SUBMITTALS

A. Section 013300 "Submittal Procedures" for submittals requirements.

B. Product Data:

1. Submit complete information concerning materials of construction, fabrication, and protective coatings.

C. Shop Drawings: Submit the following:

1. Shop and erection drawings prepared and certified by the ammoniation system manufacturer showing important details of construction and installation.
2. The total weight of the equipment including the weight of individual components.
3. A complete bill of materials for all equipment.
4. Indicate materials and equipment, including wiring and control diagrams, performance charts and curves, installation and anchoring requirements, fasteners, and other details.
5. Complete description of all controls and control panels, including complete master wiring diagrams, elementary or control schematics, and panel outline drawings.
6. Schematic diagram of each system, including tag marks for each item of equipment cross-referenced to ammonia system equipment list.
7. Complete description of surface preparation and shop prime painting, including written certification from the manufacturer that materials and equipment, including all coatings, are suitable for use in an ammonia environment.

1.8 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports: Submit certified factory test results.

B. Manufacturer's Instructions:

1. Submit detailed instructions on installation requirements, including storage and handling procedures, anchoring, and layout.

2. Submit installation, selection, and hookup configuration, with pipe and accessory elevations.
3. Submit hanging and support requirements and recommendations.

C. Field Quality-Control Submittals: Indicate certified results of Contractor-furnished tests and inspections.

D. Manufacturer Reports: Indicate that equipment has been installed according to manufacturer's instructions.

E. Qualifications Statements:

1. Submit qualifications for manufacturer and installer.
2. Submit manufacturer's approval of installer.

F. Submit a list of the manufacturer's recommended spare parts required for one-year normal operation and maintenance. Include gaskets, packing, etc. on the list, as well as current prices for all parts.

G. Submit the recommended lubricants along with alternative references to products of other manufacturers.

1.9 CLOSEOUT SUBMITTALS

A. Section 017700 “Closeout Procedures”: for closeout procedures requirements.

B. Project Record Documents: Record actual locations and final orientation of equipment and accessories.

C. Operation and Maintenance Data: Submit maintenance instructions for equipment and accessories.

D. Warranty for each system component.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Section 017700 “Closeout Procedures” for maintenance materials requirements.

B. Spare Parts:

1. Furnish one set of manufacturer's recommended spare parts, for one year’s normal operation and maintenance of the equipment, including:

a. For each ammoniator:

1) One set of gaskets.
2) One valve body.
3) One set of gaskets.
4) One spare rotameter and v-notch orifice controller.

5) One diaphragm for differential regulating valve.
6) One diaphragm for drain relief trimmer valve.

b. For each vacuum regulator:

1) One diaphragm.
2) One set of gaskets.
3) One set of O-ring, valve seat, and valve plug.
4) One flow rate indicator.

c. One Injector/Ejector diaphragm of each size.
d. One spare remote gas flowmeter with rate valve.
e. Three gaskets to fit joints and unions.

C. Tools: Furnish special wrenches and other devices required for Owner to maintain and calibrate.

1.11 QUALITY ASSURANCE

A. Provide materials and equipment free from all defects and imperfections that might affect the serviceability of the finished product:

1. Do not provide equipment or materials that have been previously used.

B. Ammonia feed system manufacturer responsibility: Check the installation requirements and provide properly sized equipment and accessories as shown on the Drawings and as necessary to ensure a properly functioning system.

C. Design, manufacture, and assemble all components of the ammonia feed system in accordance with the Compressed Gas Association, G-2 Anhydrous Ammonia, Edition 8. CGA, (1995).

1.12 QUALIFICATIONS

A. Manufacturer: Company(s) specializing in manufacturing products specified in this Section with minimum Ten years' documented experience.

B. Equipment specified herein to be furnished by a single ammoniation system manufacturer regularly engaged in the production of ammoniation equipment

1.13 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 “Product Requirements” for transporting, handling, storing, and protecting products requirements.

B. Deliver materials in manufacturer's packaging; include installation instructions.

C. Inspection: Accept equipment on-Site in manufacturer's original packaging. Inspect for damage.

D. Store products according to manufacturer's instructions and in areas protected from weather, moisture, or possible damage.

E. Protect systems from entry of foreign materials by using temporary covers and by isolating parts of completed system.

1.14 WARRANTY

A. Section 017700 "Closeout Procedures" for warranty requirements.

PART 2 - PRODUCTS

2.1 AMMONIA FEED SYSTEM

A. Under normal operating conditions, gaseous ammonia to be conveyed under pressure from the duty ammonia storage tank to a vacuum regulator where the ammonia pressure will be reduced to less than atmospheric pressure. Flow rate of ammonia to be metered and controlled by the ammoniators prior to an ejector assembly that will generate ammonia solution that is discharged to the application point.

B. Ammoniation system to include:

1. Connection to two existing steel pressurized ammonia storage tanks of 750-gallon and 1,000-gallon capacities.
2. Ammoniators, injectors/ejectors.
3. Vacuum regulators.
4. Valves.
5. Piping.
6. Ammonia system enclosure and appurtenances, as shown on the Drawings.
7. Instruments, and appurtenances required for a complete and operable system, as shown on the Drawings.

C. Manufacturers:

1. Ammonia Gas Feed Equipment:

   a. Wallace & Tiernan of Evoqua Water Technologies, Inc.
   b. Capital Controls of DeNora.
   c. Or approved equal.

2. Substitutions: Section 016000 "Product Requirements."

D. The ammoniators to be paced off plant flow via. a 4-20mA signal.

E. Provide materials of construction suitable for ammonia gas service.

F.

F. Furnish ammonia feed system complete in every respect and include all necessary appurtenances and adapters, whether or not specifically mentioned herein or shown on the Drawings but required for its proper operation.

G. Individually route vent lines from ammonia feed system equipment specified herein to the outside of the ammonia feed panel, whether or not so indicated on the Drawings.

2.2 AMMONIATOR

A. Performance and Design Criteria

1. Two 550 ppd Vacuum Ammoniators with Rotameters:

   a. Tag Numbers: AMN-150721, AMN-150722.
   b. Wall-Mounted.
   c. Evoqua Model V-2000 or approved equal.

B. Provide ammoniators to indicate and control the ammonia gas flow rate, including the following:

1. Vacuum operated, with vacuum regulators on the gas supply.
2. Positive acting gas shut-off valves.
3. Gas feeder module control units.
4. Vacuum relief valve.
5. Diaphragm operated differential regulating valve.
6. Variable orifice (plug).
7. Rate valve for manual dosage adjustment.
8. Electric plug positioner and controller.
9. Gas flow rotameter meter.
10. Vacuum gauges measuring high and low vacuum.

C. NEMA 4X plug positioner:

1. Plug positioner to utilize a heavy-duty motor.
2. Designed to automatically control gas feed rate in response to a 4 to 20 mA signal proportional to plant flow.
3. Valve positioner to provide a 4-20 mA feedback valve position signal to electronic controller.
4. Set ammoniators for flow pacing control.
5. Provide manual dosage adjustment locally in the NEMA 4X electronic controller.
6. In the event of power failure, gas flow will be manually adjustable.

D. Provide automatic control valve comprised of a controller and a variable area orifice rate valve incorporated into one unit:

1. Motion of the valve achieved by means of a linear stepper motor without the use of a feedback potentiometer.
2. Minimum length of the variable area orifice portion of the rate valve stem: 40 mm.

E. Bypass Piping and Valve Assembly:

1. Provide ammoniator with bypass piping and valve assembly to allow for the selection of automatic feed control or bypass (manual) feed control.
2. Select manual feed control to isolate the automatic control valve.
3. Material:

    a. Socket welded schedule 80 PVC pipe and pipe fittings.
    b. Bypass valves: Seals materials suitable for ammonia gas application.

F. Provide a changeable rotameter on the cabinet face to indicate ammonia gas flow.

G. Provide ammoniator with gauges for indication of ammonia gas vacuum. Provide loss-of-vacuum and out-of-gas alarm switches and contacts for remote alarms.

H. Ammoniator accuracy in the automatic control mode: plus or minus four percent of indicated flowrate over a 10:1 range.

I. Materials of Construction: Constructed entirely of materials resistant to the corrosive attack of ammonia gas:

1. Metal parts in contact with ammonia: Silver-plated, Hastelloy C or equal.
2. External metal parts: Type 316 stainless steel.
3. Parts not designed to be in contact with ammonia: Totally enclosed, with the degree of protection of NEMA 4X.
4. Control equipment and components: Enclosure to NEMA 4X

J. Provide a dry contact rated for 120VAC at 5A from each ammoniator to the Plant SCADA system for the following statuses:

1. Ammoniator running,
2. Ammoniator in remote
3. Ammoniator common alarm.

2.3 MASS FLOW METERS

A. Design Criteria:

1. Two Mass Flow Meters:

    a. Tag Numbers: FE/FIT-150723, FE/FIT-150724
    b. Sierra Smart Trak M100L, or approved equal.

B. Provide mass flow meters with the following:

1. Sensor tube with two RTD coils around, and the gas mass flow carries heat from the upstream coil to the downstream coil. Smart Trak microprocessor measures the temperature difference and calculates the output signal, which is linearly proportional to gas mass flow.

2. Function/Performance:

   a. Program to measure Ammonia gas.
   b. Gas and Ambient Temperature: 32 to 122 degree F.
   c. Standard Gas Pressure: 500 psig maximum.
   d. Accuracy (including flow element): Plus or minus 1.0 percent of full scale including linearity under calibration conditions.
   e. Repeatability (including flow element): Plus or minus 0.2 percent of full scale.
   f. Temperature Coefficient: Plus or minus 0.025 percent of full scale per degree F, or better.
   g. Pressure Coefficient: Plus or minus 0.01 percent of full scale per psi, or better.
   h. Response Time: 2 seconds (typical) to within Plus or minus 2 percent of final value (includes settling time).
   i. Output: Linear 4-20 mA output.
   j. User-friendly Pilot Module – a front-mounted device that allows users to change flow rate or re-configure the instrument.
   k. Display: Digital indicator displaying flow in engineering units.
   l. Power Requirements: 24-30 Vdc

3. Physical:

   a. Wetted parts to be Type 316 stainless-steel.
   b. Suitable for surface mounting
   c. NEMA 4X (IP65) rated when installed in non-hazardous areas and explosion proof approved for Class 1, Division 1, Groups C and D (EEx d IIC) when installed in hazardous areas.

2.4 VACUUM REGULATORS

A. Design Criteria

1. Two 550 ppd Vacuum Regulators:

   a. Tag Numbers: PREGV-150721, PREGV-150722.
   b. Manufacturer: Evoqua, DeNora, or approved equal.

B. Provide vacuum regulators with the following:

1. Vacuum-regulating valve designed to reduce full supply pressure to vacuum.
2. Drip leg with 25-Watt heater (120 VAC, 60 Hertz, single phase power supply).
3. Gas shutoff capability.
4. Internal pressure relief capability.
5. Positive indication of operating mode.
6. Spring-opposed diaphragm to control vacuum and close tight upon loss of vacuum
7. Pressure relief valve with separate ports for ammonia feed and vent:

   a. Provide connections for tubing vented gas away from the pressure relief/vent port of the vacuum regulator to atmosphere outside the ammonia feed panel.
   b. Equip the outside end of the vent tubing with an insect screen.

C. Materials of Construction:

1. Vacuum regulator body parts: PVC.
2. Inlet springs: Tantalum alloy.
3. Inlet adapter: Hastelloy C.

D. Mounting:

1. Wall mounted vacuum regulators, with diaphragm protected pressure gauge, and a union flange for connection to the ammonia gas manifold.

2.5 EJECTOR ASSEMBLY

A. Design Criteria:

1. Two 550 ppd Ejectors:

a. Tag Numbers: EJT-150721, EJT-150722.
b. 2 Inch, Fixed-Throat.

B. Description: Water operated, Venturi nozzle type.

C. Appurtenances included with each ejector:

1. Check valves: Integral spring loaded, normally closed ball check and diaphragm back check valves on the gas inlet connection to prevent the backflow of water into the ammonia gas equipment. Integral spring loaded, normally closed ball check valves on the plant water inlet connection.

D. Water Supply Pressure Available: 50 psig.

E. Maximum Water Supply Flow Rate Available: 20 gpm.

2.6 AMMONIA GAS FILTER / STRAINER

A. Provide and install gas filters / strainers designed to remove impurities from ammonia gas, with easy disassembly for servicing.

B. Description: Two chamber systems:

1. Lower chamber: trap for liquid impurities.
2. Upper chamber: contain a removable filter cartridge especially designed to trap particulate matter.
3. Filter body constructed of 25,000-lb strength cast iron tested to a pressure of 500 psig.
4. Filter cartridge constructed of stainless steel.

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2.7 PIPING AND FITTINGS

A. Rigid pipe runs for pressurized ammonia gas service:

1. Pipe: seamless carbon steel, Grade B, Schedule 80, Type S per ASTM A-106 and ES 8198 and suitable for use with ammonia gas.
2. Fittings: 3,000 lb CWP, forged carbon steel threaded connections.

B. Rigid pipe runs for ammonia gas lines under vacuum service. As shown on the drawings:

1. Schedule 80 PVC with solvent welded joints in accordance with the requirements of Section 400531.
2. Stainless steel tubing in accordance with the requirements of Section 400523.

C. Rigid pipe runs for ammonia solution lines. As shown on the drawings:

1. Schedule 80 PVC with solvent welded joints in accordance with requirements in Section 400513.
2. HDPE in accordance with requirements in Section 400531.

D. Provide and install all aspects of pipe and fitting construction in conformance with Compressed Gas Association, G-2 Anhydrous Ammonia, Edition 8. CGA, (1995).

E. Test and thoroughly clean all piping before use in conformance with the Compressed Gas Association, G-2 Anhydrous Ammonia, Edition 8. CGA, (1995).

2.8 VALVES

A. Ball Valves on carbon steel piping for gaseous ammonia:

1. Body: Threaded carbon steel.
2. Ball and stem: Hastelloy C.
3. Valve seats and stem seals: Teflon (PTFE).
4. All hardware, including bolts, supports, hooks: 316 stainless steel.
5. Rated for 400 psi and provided with shut-off and vent ammonia safely toward the high pressure (upstream) side of the valve.
6. Manufactures: Flowserve- Worcester or approved equal.

B. Ball Valves on PVC or CPVC piping for ammonia vacuum and solution lines:

1. Body, ball, and stem: PVC or CPVC to match the connected piping.
2. Valve seats: Teflon (PTFE).
3. Seals and o-rings: Viton.
4. Full port true union.
5. Suitable for service to 120 degrees F with non-shock service pressure rating of not less than 120 psi at 70 degrees F.
6. Manufactures: Asahi/America, Chemtrol, Spears or George-Fisher.

C. Ball Check Valves on PVC piping for ammonia vacuum and solution lines:

1. Body: PVC.
2. Valve seats: Teflon (PTFE).
3. Valve seals: Viton.
4. Double-union style with socket ends.
5. Solid and completely spherical ball.
6. Capable of either horizontal or vertical mounting.
7. Manufactures: SXE Series as manufactured by IPEX or equal.

D. Test and clean all valves for ammonia service in accordance with the Compressed Gas Association, G-2 Anhydrous Ammonia, Edition 8. CGA, (1995) and delivered to site in sealed packaging.

2.9 ACCESSORIES

A. Ammonia feed panel enclosure:

1. Provide two ammonia feed panel enclosures as shown on the drawings.
2. Minimum dimensions: 6-ft wide, by 7-ft tall, by 2-ft deep.
3. Access: Double doors.
4. Material of construction: 316 stainless steel.
5. Factory install ammonia feed system and accessories within each panel.
6. Accessories: Heaters, fans, lights as specified herein.

B. Heater:

1. Convection heating type designed for use in hazardous locations (Class 1, Div 1).
2. Material: black, anodized aluminum.
3. Heating capacity: 600 W.
4. Rated voltage: 108-132 VAC or VDC.
5. Provided with Class 1, Div 1 thermostat rated for -76°F to 302°F operating range and nominal setpoint of 50°F.
6. nVent DAHHL6001A heater with HLSTAT10C thermostat, or equal.

C. Exhaust Fan:

1. UL listed side-mount exhaust fan with gasket.
2. Material: UV-resistant plastic.
3. Free airflow: 12 cfm.
4. Airflow with 1 exhaust grille: 8 cfm.
5. Service life at 40°C: 100,000 hours.
6. Rated voltage: 24 VDC.
7. Provided with exhaust grille and type 304 stainless steel shroud with pest screen.
8. Provided with installation hardware.
9. nVent HF0524514, or equal.

D. Intake Air Louver:

1. Material: 316 stainless steel.
2. Dimensions: 8.19 x 9.5 inches.
3. Thickness: 0.31 inch.
4. Opening area: 12.11 square inches.
5. Provided with installation hardware.
6. nVent AVK86SS6 louver with AFLT86 louver plate kit filter.

E. Low Temperature Switch:

1. UL listed, NEMA 4X with SPDT switch.
2. Coiled air, stainless steel bulb.
3. Temperature range: -30°F to 100°F with adjustable setpoint.
4. Voltage rating: 120 VAC and 24 VAC.
5. PECO TF115-023, or equal.

F. Panel Light:

1. Voltage: 24VDC.
2. UL listed, shall maintain enclosures Type 4X rating when installed.
3. LED Light, 15 in.
4. Controlled by Remote door switch ALDSWD by nVENT/Hoffman, or equal.
5. Manufactured by nVENT/Hoffman, Type Panelite LED24V15 or equal.

G. 24VDC Power Supplies:

1. Input power: 115VAC, plus or minus 10 percent, 60 Hz.
2. Output voltage: 24VDC.
3. Output voltage adjustment: 5 percent.
4. Sized for at least 3.8A.
5. Enclosure: NEMA 4X.
6. Mounting: Mounted to panel as required to maintain NEMA rating of the panel. Mounted such that heat dissipation does not adversely affect other panel components.
7. Equipped with power on/off circuit breaker.
8. Output overvoltage and overcurrent protective devices to protect from damage due to power supply failure and external failure.
9. SOLA HD model SCP-X or equal.

H. Panel Lock and Access Control:
1. Provide access control to the panel by means of a card reader and electromagnetic lock.
2. Card reader: HID multiCLASS Reader
3. Electromagnetic lock: ASSA ABLOY SECURITRON M32

I. Provide surge protection devices for control system power, signal, and communication lines as specified in Section 407856 "Isolators, Intrinsically Safe Barriers, and Surge Suppressors." Surge protection is required at both ends for all wiring outside the building envelope.

2.10 AMMONIA GAS DETECTION SYSTEM:

A. Description: Ammonia gas detection system including ammonia leak detectors and control unit to be suitable for ammonia leak detection and alarm applications.

B. Materials: corrosion resistant to ammonia gas environment.

C. Ammonia leak detectors:

1. Quantity: Two.
2. Tag Numbers: AE/AIT-150731, AE/AIT-150732, AE/AIT-150733.
3. Wall-mounted, suitable for monitoring ammonia concentrations between 1 ppm and 100 ppm by volume.
4. Ammonia gas sensor:

    a. Bemodular "plug-in" type without any wiring work to facilitate easy replacement.
    b. Electrochemical type.
    c. Minimum service life: 1 year.
    d. Suitable for at least two hours' duration of exposure to concentrated ammonia gas.
    e. Maximum 90% pick up response time: 150 seconds.

5. Adjustable alarm setpoints.
6. Powered by DC supply from its own control panel.
7. Factory calibration by direct ammonia gas. Provide pre-calibration to certificate issued by the manufacturer.
8. Gas detection system to be model Acutec 35 Gas Detection System by Evoqua, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017300 "Execution" for installation examination requirements.

B. Verify layout and orientation of equipment, accessories, and piping connections.

3.2 INSTALLATION

A. Install equipment and accessories as recommended by manufacturer and as indicated on Drawings.

B. Installation Standards: Install Work according to the recommendations of the Compressed Gas Association, G-2 Anhydrous Ammonia, Edition 8. CGA, (1995).

C. Ammonia system Manufacturer/Supplier to furnish the services of competent factory representatives familiar with the installation of the respective equipment furnished to supervise the installation of each piece of equipment and the system.

D. Ammonia system Manufacturer/Supplier to provide written instructions and complete erection and installation drawings for the receiving, moving, storing, placement, installation and start-up of the system.

E. Following installation, clean and dry all portions of ammonia system such that it is free from all moisture, mill-scale, rust, grease dirt, and other foreign materials before use. Do not use hydrocarbons or alcohols for cleaning. Dismantle and clean before use any equipment received in an oily condition.

F. Test PVC piping in accordance with Section 400511.

G. Purging:

1. Following installation, purge the ammonia steel piping system with nitrogen to ensure removal of all moisture.
2. Purge the piping system at high volume rates to blow all moisture out of the pipe.
3. Nitrogen purge will begin at one end of the piping system and should be open at the furthest point away for complete treatment of the pipe.
4. Purge the entire piping system until the system is dried to dew point (minus 40 degrees F).
5. Immediately upon successful drying, seal the system from the outside environment and pressurize with nitrogen to 300 psig and held for 30 minutes with zero variance.
6. If any variance occurs, tests piping for leaks with soapy water to the outside of the joints:

    a. Repair any leaks in the piping system.
    b. If the repair exposes the interior of the piping system to atmosphere, the piping re-purge piping to remove all moisture prior to beginning the nitrogen pressure testing.
    c. Remove pressure gauges, relief valves and other components which may have been damaged during testing and the opening sealed prior to testing.

3.3 SURFACE PREPARATION AND PAINTING

A. Prepare and paint all surfaces as part of the work under this Section.

B. Refer to Surface preparation and shop painting and finish painting to be as specified under Division 09.

3.4 CLEANING

A. Sections 017300 “Execution” and 017700 “Closeout Procedures” for cleaning requirements.

B. Clean portions of ammonia system to remove cutting oil, grease, and other foreign materials; do not use hydrocarbons or alcohols for cleaning residuals from these materials.

C. Before use, dismantle and clean new valves or other equipment received in oily condition. Test valves with clean, dry air at 150 psig for seat tightness before installation.

D. Dry ammonia piping before use using steam and dry air; if steam and dry air are not available, purge completed system with dry cylinder air or nitrogen to remove moisture.

3.5 FIELD QUALITY CONTROL

A. Section 017300 "Execution": for testing, adjusting, and balancing requirements.

B. Equipment Acceptance: Adjust, repair, modify, or replace components failing to perform as specified, and rerun tests; make final adjustments to equipment under direction of manufacturer's representative.

C. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than two days on-Site for installation, inspection, field testing, and instructing Owner's personnel in maintenance of equipment.

D. Furnish installation certificate from equipment manufacturer's representative attesting equipment has been properly installed and is ready for startup and testing.

3.6 FIELD INSPECTION, TESTING AND CORRECTION OF DEFICIENCIES

A. After installation is approved by the manufacturer's representative and in the presence of the Engineer and under the supervision of the representative, perform a full operating test on the complete ammonia system to ensure the functioning of all component parts and the system.

B. Leakage Testing: Pressurize entire ammonia system with nitrogen to at least 150 psig. With system under pressure, test each joint and connection for leaks by applying soapy water to each joint and connection.

C. Provide manufacturer field services including instrument calibration, oversight of installations of the instruments, and start-up of the sensors/transmitters in order to provide reliable measurement at the instruments. Work with the PCSS to verify the transmitter sends correct information to the control system (i.e., that the scaling and units are the same at the instrument and on the control system's operator interface/PLC). Submit an instrument calibration report in order to document the calibration procedure of the instruments.

D. Coordinate signal interface and testing with PCSS to verify all required signals are integrated at SCADA and system interface with SCADA is fully functional.

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3.7 DEMONSTRATION

A. Section 017900 "Demonstration and Training" for demonstration and training requirements.

B. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.

C. Performance Testing: Test each piece of ammonia feed equipment under design conditions for four hours to demonstrate proper functioning and automatic regulation of system; test alarms and signal generation; exercise equipment control and manual override where applicable; demonstrate equipment safety features.

END OF SECTION 463116

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SECTION 463126.15 - EMERGENCY GAS TREATMENT SYSTEMS - CHLORINE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Conditions of Contract, and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. Section includes dry media-type emergency chlorine gas evacuation and scrubbing system.

B. Related Requirements:

1. Section 033000 “Cast in-Place Concrete” for system foundation.

1.3 PREINSTALLATION MEETINGS

A. Section 013100 “Project Management and Coordination” for preinstallation meeting requirements.

B. Convene minimum one week prior to commencing Work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of scrubber vessel.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
5. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

1.5 DELEGATED-DESIGN SUBMITTAL

A. Provide design for emergency chlorine gas treatment scrubber, a non-hazardous, non-toxic packaged, deep bed, dry chemical system. Comply with standards of the Chlorine Institute Inc.

B. Provide detailed calculations, prepared and signed by an experienced licensed professional engineer registered in Illinois, which demonstrate the system meets the design and performance requirements specified herein:

1. Draft (inches water column) provided by exhaust fan.
2. Air flow rate.
3. Certification that the air flow rate and draft provided by the scrubber is met when used with the duct system shown on the Drawings.
4. Volume and wall thickness of the scrubber tank.
5. Certification that the system will meet the performance requirements specified in Paragraph 2.3.A, of this section.

1.6 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Material test reports.

C. Product test reports.

D. Research reports.

E. Source quality-control reports.

F. Field quality-control reports.

G. Sample warranty.

H. Handling instructions including chemical safety data sheets for the media used in the scrubber. Include supplier's written instructions and safety procedures for storage, handling and transfer of the media.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Operation and maintenance data.

C. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. After startup, provide all PLC Program Files electronically in their original format on media flashdrive.
3. Device address list.
4. PDF file of software application and graphic screens.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish all special tools and test equipment required for the proper servicing of all equipment. All such tools and test equipment shall be furnished in a suitable steel tool chest complete with lock and duplicate keys.

B. All spare parts shall be properly protected for long periods of storage and packed in containers that are clearly identified with indelible markings as to contents.

C. Furnish the following spare parts for each scrubber:

1. One set of fuses for each control panel.
2. One set of lamps for each control panel.
3. One set of V-belts for each exhaust fan.
4. Two spare gas detection sensors for each scrubber.
5. Two sensor calibration kits for each gas detection system.

1.9 QUALITY ASSURANCE

A. Manufacturer minimum qualifications: Ten years of experience in the design, fabrication and testing of packaged chlorine scrubbing systems that are efficient in converting chlorine gas to non-toxic solids with less than 5 ppb at discharge. Submit verification of experience.

B. Manufacturer:

1. Single source provider of equipment, media, and testing services
2. Certified to ISO-9001:2015 standards. Submit ISO: 9001-2015 certificate.

1.10 WARRANTY

A. Section 017700 “Closeout Procedures” for warranties requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Emergency Gas Scrubber, manufactured by PURAFIL, Model FOC1.

B. Comparable approved product by one of the following:

1. De Nora Water Technologies, Type DES3000 1 Ton.

2.2 SYSTEM DESCRIPTION

A. Complete chlorine scrubber system designed to automatically withdraw air containing chlorine gas from the Chlorine Gas Storage Room, upon activation by a chlorine leak detector. Provide all components and controls required to withdraw the air from this room through a duct system and provide treatment to remove the chlorine gas prior to discharge into the atmosphere. Furnish and install all necessary accessory equipment and auxiliaries, whether specifically mentioned in this Section or not, as required for a complete and functional system.

B. Chlorine scrubber system:

1. Factory pre-fabricated and delivered to the site complete and ready for installation on a concrete foundation, and connection of ventilation ductwork; and power supply, signal, and alarm wiring.
2. Field assembly only allowed for those components which cannot be shipped assembled on the unit.
3. Provide a control panel, completely wired and ready to be connected to the components.

C. Vessel: manufactured of filament wound fiberglass construction in accordance with ASTM D-3299 standard specifications and PS 15-69 product standard:

1. Resin: Suitable for continuous exposure to a wet chlorine/air mixture with maximum operating temperature of 94 degrees C.
2. Inner surface: Contain one layer of vinylester resin and measure a minimum of 10 to 20 mils followed by the interior layer consisting of two plies of chopped strand mat composed of reinforced non-continuous glass fiber strands equivalent three ounces/ft with a vinylester resin.
3. Reinforcement content of inner surface and interior layer: 27% +/-5% by weight.
4. Average glass concentration of filament wound laminates: 50-80% by weight.
5. Hand Layup laminates when used on the vessels and equipment: Fabricated to meet the physical properties in accordance with ASTM D-3299 product standard.
6. Press molded or compression mold flanged nozzles are not acceptable.
7. Reinforce all cut-walls as required by ASTM D-3299 and PS 15-69.
8. Equip vessel with the following accessories:

    a. Two 24-inch diameter manways.
    b. Inlet and outlet nozzles.
    c. FRP grating platform with railing and ladder.
    d. Media sample ports on the side and top of vessel.
    e. Lugs for anchoring tank to concrete pad.
    f. All necessary corrosion-resistant hardware for installation of tank and accessories.
    g. Lifting lugs permanently attached and suitable for lifting and transporting the vessel without structural damage.

D. Blower Section:

1. Externally mounted blower, belt driven, FRP with backward inclined blades sized to deliver a minimum of 5,000 CFM under ambient conditions.
2. The blower is located to cause air (gas) to be drawn through the scrubber, thus maintaining the scrubber and storage room at a vacuum.
3. Motor: 40 hp, 460 volt, 3-phase, 60 Hz, TEFC motor.
4. Use measured pressure drop data from "full bed-depth" testing in the design of the blower.
5. Blower to provide adequate static pressure to pass the air through the scrubber and include 2-inch wc. of external static pressure.

E. Media Bed Section:

1. Media bed support system:

a. As recommended by the media supplier. If the vessel walls are used in conjunction with the support system, design the vessel walls in full accordance with these specifications.
b. Provide removable support system, including removable columns, grating and angles. Construct all components of the support system of materials resistant to the service conditions specified for corrosion and exposure to wet chlorine in air at 93 degrees C.

2. Provide each vessel with 1-1/2-inch side-mounted sample probes that extend into the media at a measurement of 6 inches (minimum). Design probes to be adequate to provide suitable extraction of media samples from the media bed and be non-binding. Probes to extend outside the vessel wall and be blocked off with a ball valve. Probes and ball valves to be of CPVC construction. Provide three top-mounted sampling probes.

F. Duct Connections:

1. Provide flexible connector located between the vessel and blower inlet.
2. Design and provide ductwork assembly and design compatible with the vessel and blower. Manufacture the ductwork in accordance with ASTM D-3299 and/or product standard PS 15-69.
3. Provide an outlet exhaust stack with a rain hood and bird screen on the blower.
4. Provide chlorine sensor/transmitter in discharge duct to shut off blower if greater than 5 ppm chlorine is detected in the discharge stream:

a. Linearity: ±10% FS or 2 ppm
b. Repeatability: ±5% FS or 1 ppm
c. Zero Drift: Less than 5%/year
d. Span Drift: Less than 10%/year
e. Operating Temperature: -40 to 185 degrees F.
f. Outputs:

1) 4-20 mA DC signal
2) Two (2) programmable alarm contacts rated for 5A at 240VAC, individually configurable over the range of the transmitter

g. Display: Digital indicator displaying chlorine concentration and LED indicators for display of alarm conditions.
h. Power Supply: 120VAC UPS backed power.
i. Enclosure: NEMA 4X (IP66)

G. Differential Pressure Instrumentation:

1. Provide a 0 to 40-inch magnehelic type differential pressure water gage included with the scrubber to permit local read-out of pressure drop through the media bed. Additionally, use pressure transmitters at the inlet and outlet to calculate the differential pressure via PLC.

H. Provide temperature sensors/transmitters on the inlet and outlet side of the scrubber vessel meeting the following requirements, installed in thermowell compatible with chlorine gas:

1. Accuracy: Plus or minus 0.36 degrees F.
2. Stability: Plus or minus 0.1 percent or 0.18 degrees F, whichever is greater, for 24 months.
3. Operating Temperature: -40 to 185 degrees F.
4. Output: 4-20 mA DC signal, linear with temperature.
5. Output capable of being set as difference or average of two measured temperatures.
6. Output configurable with custom curves, including Callendar-Van Dusen correction.
7. Display: Digital indicator displaying temperature in engineering units.
8. Diagnostics:

    a. Self-diagnostics with transmitter failure driving output to above or below out of range limits.
    b. LED indication of transmitter faults.
    c. Capable of simulation of inputs and loop outputs.
    d. Include test terminals to allow for connection of test equipment without opening the 4-20mA DC loop.

9. Power Supply: 24 VDC loop power.
10. Enclosure: NEMA 4X (IP66)

I. Provide pressure sensors/transmitters on the inlet and outlet side of the scrubber vessel meeting the following requirements:

1. Accuracy: 0.075 percent of span.
2. Operating Temperature: -40 to 185 degrees F
3. Output Signal: 4 to 20 mA DC linear with pressure
4. Output: Zero adjustable over the range of the instrument calibrated span is greater than the minimum calibrated span.
5. Stability: 0.05 percent of upper range limit for 1 year.
6. Response Time: Less than 1 ms.
7. Display: Digital indicator displaying pressure
8. Diagnostics:

    a. Self-diagnostics with transmitter failure driving output to above or below out of range limits.
    b. Simulation capability for inputs and loop outputs.
    c. Test terminals available to ease connection for test equipment without opening the loop.
    d. Registers to record minimum and maximum pressure and temperatures transmitter has been exposed to be available.

9. Over Range Protection: Provide positive over range protection to 150 percent of the maximum pressure of the system being monitored.
10. Power Supply: 24 VDC loop power.
11. Enclosure: NEMA 4X (IP66)
12. Materials:

    a. Isolating diaphragm and other wetted parts: compatible with chlorine gas.
    b. Gaskets and O-rings: Teflon.
    c. Sensor Fill Fluid: Compatible with operating temperature of -4 to 176 degrees F.

J. Provide low flow switch to shutdown the exhaust blower on low gas flow meeting the following requirements:

1. Operating Temperature: -4 to 176 degrees F
2. Output: Form 2C (DPDT) snap action, hermetically sealed switch, rated for 10 amps, 125/250 volts AC
3. Switch housing: NEMA 4X (IP66)
4. Materials: compatible with chlorine gas

K. Control Panel:

1. NEMA 4X, stainless steel enclosure:

   a. Panels of 12-gauge sheet steel.
   b. Front panels or panels containing instruments: provide 10-gauge stretcher-leveled sheet steel, reinforced to prevent warping or distortion.
   c. Provide angle stiffeners on the back of the panel face to prevent panel deflection under instrument loading or operation.
   d. Full height and fully gasketed access door with full-length, continuous, piano type stainless steel hinges with stainless steel pins.
   e. Provide all conduit and cable penetrations with ground bushings, hubs, gasketed locknuts, and other accessories as required to maintain the NEMA rating of the panel and electrical rating of the conduit system.
   f. Mount all components in a manner that permits servicing, adjustment, testing, and removal without disconnecting, moving, or removing any other component.
   g. Install suitable gaskets and faceplates, required to maintain NEMA rating of the panel.

2. Provide UL 508 label on complete assembly:

   a. UL listing includes enclosure, specific equipment supplied with enclosure, and equipment installation and wiring within and on the enclosure. If required for UL labeling, provide ground fault protective devices, isolation transformers, fuses and other equipment necessary to achieve compliance with UL 508A requirement. The Drawings do not detail all UL 508A requirements.

3. Temperature control:

   a. Provide forced air ventilation fans to create positive internal pressure within the panel.
   b. Submit heat load calculations to determine heating/cooling requirements to ensure the internal temperature of the panel is regulated between 45 to 104 degrees F under all conditions.
   c. Provide force air ventilation or air conditioning units as required to prevent temperature buildup inside of panel.
   d. Provide an integral heater, fan, and adjustable thermostat as required.
   e. Protect panels from internal corrosion by use of corrosion-inhibiting vapor capsules.

4. Motor starter: FVNR, ATL with overload heaters, for up to 40 hp. 460 VAC motor.
5. Control panel transformer, 460/120 VAC, with fused primary and secondary.
6. Main circuit breaker, magnetic, with front-panel operating handle.
7. Allen Bradley 1609-D Uninterruptible Power Supply

8. Allen-Bradley CompactLogix 5380 PLC and PanelView Plus 7 Performance touch screen for operator interface and display as shown on Drawings with the following as a minimum:

    a. "Hand-Off-Auto" selector switch.
    b. "Reset" push button.
    c. Indicating lamps (all lamps are push-to-test style):

        1) "Chlorine Storage Room Leak"
        2) "Chlorine Storage Room Warning"
        3) "Outlet Residual Chlorine High Alarm"
        4) "Outlet Residual Chlorine High-High Alarm"
        5) "Scrubber Running"

    d. E-stop pushbutton (push-pull).
    e. Strobe and Horn (for chlorine leak alarm).
    f. "Silence" push button.
    g. LED digital display:

        1) "Chlorine Storage Room Concentration"
        2) "Outlet Residual Chlorine Concentration"

9. Scrubber System Panel PLC Communication: Communicate to the plant SCADA system via EtherNet/IP, including the following inputs/output signals as a minimum:

    a. Inputs:

        1) Remote start, if in "Auto" (from Chlorine alarm panel or from SCADA).

    b. Outputs:

        1) "Scrubber System in Auto"
        2) "Scrubber blower running"
        3) "Scrubber fault"
        4) "Exhaust Blower Low Gas Flow"
        5) "Scrubber E-STOP Active"
        6) "Scrubber Inlet Pressure"
        7) "Scrubber Outlet Pressure"
        8) "Scrubber Inlet Temperature"
        9) "Scrubber Outlet Temperature"
        10) "Chlorine Storage Room Leak"
        11) "Chlorine Storage Room Warning"
        12) "Chlorine Storage Room Sensor Failure"
        13) "Chlorine Storage Room Analyzer Reading"
        14) "Outlet Chlorine Analyzer Reading"
        15) "ATC Alarm"

10. Scrubber System interface with ATC Panel:

    a. Send a hard-wired "Scrubber Running" signal to the ATC Panel.
    b. Receive a hard-wired "ATC Alarm"" signal from the ATC Panel.

L. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA70, by a qualified testing agency, and marked for intended location and application.

M. Provide surge protection devices for control system power, signal, and communication lines as specified in Section 407856 “Isolators, Intrinsically Safe Barriers, and Surge Suppressors.” Surge protection is required at both ends for all wiring outside the building envelope.

2.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements" to design emergency chlorine gas treatment scrubber to meet the following requirements:

1. Neutralize the adverse consequences of an actual one-ton chlorine spill at release rates of 400 lb/minute. Neutralize the entire contents of a one-ton container containing 2,350 lb (design load) of chlorine.
2. Treat chlorine releases from the Chlorine Storage Room. Chlorine gas leak detectors will signal the presence of a leak and initiate scrubber operation, drawing contaminated air from the location of the leak.
3. Lower the concentration in the Chlorine Storage Room to 1 ppm in less than 120 minutes after evaporation of all gaseous chlorine:

    a. Maximum Allowable Discharge Concentration of the Gas: No greater than 5 mg/L which is equal to one-half of the Immediately Dangerous to Life and Health - Air Concentration Values (IDLH).
    b. Air Flow Operation Rate: minimum 5,000 CFM.
    c. Chlorine Concentration: No greater than 5 ppm at the discharge duct.
    d. Design ductwork to ensure the system has sufficient draft.

4. Meet the Uniform Fire Code requirement to maintain the contaminated room under a negative pressure.
5. Absorption media required to be non-hazardous both before and after exposure to chlorine vapor and be disposable at a common landfill.
6. Minimum auto ignition temperature of the media: 300 degrees C per auto ignition Test Method ASTM D-3466.
7. Be constructed of materials that will resist corrosion from the chlorine gases and liquids being handled.
8. Provide sensor in discharge duct capable of detecting a chlorine gas concentration of 0 to 10 ppm as specified in Section 407626. Disable blower if greater than 5 ppm chlorine is detected in the discharge stream.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes:

1. Temperature Change: 49 deg C, ambient; 82 deg C.

C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency:

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

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2.4 MATERIALS

A. Media:

1. Minimum of 18,000 lbs of chemically impregnated; activated alumina-based media.
2. Manufactured, generally spherical porous pellets formed from powdered activated alumina, suitably impregnated with chemicals to enhance the capacity for removal of chlorine and to chemically react to produce solid reaction products within the media.
3. Impregnates applied during pellet formation, such that the impregnate is uniformly distributed throughout the pellet volume.
4. UL Classified class 2.
5. Physical properties:

    a. Crush strength: 35% - 70%.
    b. Average abrasion: 4.5%.
    c. Bulk density: 40 lbs/ft3
    d. Average pellet diameter: 1/8 inch
    e. Removal Capacity against Cl2: 15% minimum by weight.

6. Pressure Drop Characteristics: Pressure drop of air at 70 degrees F, when flowing through a 12-inch deep, packed media bed, not to exceed the following limits:

Superficial Velocity (fpm)	Pressure Drop (inch water column)
50	0.45
100	1.85

2.5 SOURCE QUALITY CONTROL

A. Certificate of Compliance: If fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to the Contract.

B. Section 014000 “Quality Requirements” for testing, inspection, and analysis requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Scrubber system before installation. Reject scrubber system that are wet, moisture damaged, or mold damaged.

B. Section 017300 “Execution” for installation examination requirements.

3.2 INSTALLATION

A. According to manufacturer instructions.

3.3 FIELD QUALITY CONTROL

A. Installation Checks:

1. Prior to system startup, inspect components for proper alignment, proper connection, and acceptable operation.
2. Provide the Engineer with originals of all testing and verification documentation associated with the inspection and testing of equipment.

B. Equipment Acceptance:

1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.
3. Provide the Engineer with originals of all completed equipment testing and verification documentation.

C. Manufacturer's Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for installation, inspection, field testing, and instructing Employer's personnel in O&M of installed equipment.

D. Installation Certificate: From equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.

3.4 STARTUP SERVICE

A. Provide at least 8 hours of manufacturer's field training services to instruct the Owner on system operation, maintenance, and media sampling.

B. Provide at least 8 hours of manufacturer's field services to conduct field performance tests. Conduct field tests to demonstrate that all components function properly in compliance with the specifications and that the unit produces the required airflow rate. Conduct field testing to demonstrate the automatic method of control. Conduct field testing after all control work has been completed. The field tests will not require leaking of chlorine, except to activate the gas detectors. Collect the following measurements during field-testing:

1. Airflow rate from the Chlorine Storage Room.
2. Pressure drop through the scrubber.

C. Provide manufacturer field services including instrument calibration, oversight of installations of the instruments, and start-up of the sensors/transmitters in order to provide reliable measurement at the instruments. Work with the PCSS to verify the transmitter sends correct information to the control system (i.e., that the scaling and units are the same at the instrument and on the control system's operator interface/PLC). Submit an instrument calibration report in order to document the calibration procedure of the instruments.

D. Coordinate signal interface and testing with PCSS to verify all required signals are integrated at SCADA and system interface with SCADA is fully functional.

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Appendix A
Geotechnical Report

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February 19, 2021

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Bloomington, Illinois 61701
P 309-821-0430
F 309-821-1242

Mr. Kevin Whitehouse
City of Bloomington
Water Department
603 West Division Street
Bloomington, Illinois 61701

RE: Geotechnical Exploration
Chemical Systems Project
Lake Bloomington Facility
McLean County, Illinois
RGE Job #21-034

Dear Mr. Whitehouse:

This report presents results of the soils exploration performed for the proposed construction of new structures associated with the improvements to the chemical treatment system at the City of Bloomington water treatment facility on Lake Bloomington in McLean County, Illinois. A summary of the subsurface exploration and recommendations for foundation design and construction follows.

Site/Project Description

The existing water treatment facility is located adjacent to the north end of Lake Bloomington, on the west side of PJ Keller Highway, north of County Road E 2550 N, in McLean County, Illinois. The improvements are planned in an asphalt paved area adjacent to the existing building on the southeastern portion of the site.

The project will require construction of a canopy for a planned ammonia system. It is expected that this structure will be supported on a shallow spread footing foundation system. New structures which will be supported on a concrete mat foundation are also planned.

Field Exploration and Laboratory Testing

One (1) soil boring was drilled for this exploration as close as practical to the location of the new structures as marked in the field by representatives of the City of Bloomington. This boring was extended to a depth of approximately 20 feet below the existing ground surface. The location of this boring is shown on the Boring Location Plan, provided by the City of Bloomington, a copy of which is included with this report.

Soil sampling was performed at 2-1/2 foot intervals to a depth of 15 feet and at 5 foot intervals thereafter to the termination depth of the boring. The samples were recovered in conjunction with the Standard Penetration Test, for which driving resistance to a 2" split-spoon sampler (N value in blows per foot) provides an indication of the relative density of granular materials and consistency of cohesive soils. Water level readings were taken during drilling and following completion of drilling operations.

All soil samples were examined in the laboratory to verify field descriptions as well as to classify them in accordance with Unified Soil Classification System. Laboratory testing included moisture content determinations and measurements of unconfined compressive strength, as appropriate. Reference is made to the attached boring log which indicates subsurface soil descriptions, water level observations, and results of field and laboratory tests.

Subsurface Conditions

The total thickness of the asphalt pavement and underlying aggregate base is approximately 1-1/2 feet. The soils directly below the pavement section consist of very silty clay. These soils range from stiff to soft in relative consistency with unconfined compressive strength values between 1.0 and 0.5 ton per square foot (tsf). Moisture content values are somewhat variable ranging from 14 to 28 percent. These soils extend to a depth of approximately 8 feet.

A layer of clayey silt was noted between depths of 8 and 11 feet. The silt is loose in relative density with an N value of 4 blows per foot. The moisture content value is 26 percent.

Deposits of sand and gravel were encountered below the silt, extending to a depth of 17 feet. These granular soils are medium dense to dense in relative density with N values between 26 and 34 blows per foot.

The underlying soils extending to the termination depth of the boring consist of silty clay. This layer is hard in relative consistency with an unconfined compressive strength in excess of 4.5 tsf. The corresponding moisture content value is 13 percent.

The bore hole was dry while drilling and upon completion and removal of the augers.

Recommendations

Foundations established at shallow depths for frost protection will bear on the soft brown silty clay which extends to a depth of 11 feet. Based upon the relative strength of these soils, we recommend that the foundations be designed based upon a net allowable bearing pressure of 1,200 pounds per square foot (psf).

Unstable conditions may result due to disturbance of the relatively low strength very silty clay soils during completion of the foundation excavations. In areas where unstable conditions are encountered due to disturbance of these deposits, they should be removed to a depth of at least 18 inches below the design bearing elevation and replaced with crushed aggregate structural fill.

The aggregate should consist of crushed stone or recycled concrete having a maximum size of 3 inches and a minimum size of ¼ inch and containing no fines. Illinois Department of Transportation (IDOT) gradation specifications for CA-1, CA-3, CA-5 and CA-7 meet these criteria. The structural fill should be densified using vibratory compaction equipment. Foundations supported on the crushed aggregate fill may be designed using the previously recommended net allowable bearing pressure.

For frost considerations, the foundations should be constructed at least 4 feet below the exterior finished grade.

Based upon measurements made in the bore hole, it appears that the groundwater level at the time the boring was completed was below a depth of approximately 20 feet. Based upon these conditions, minimal amounts of groundwater seepage are anticipated into the shallow excavations. We anticipate that the water seepage can be controlled by pumping the water from temporary construction sumps located outside the perimeter of the excavations.

Conclusion

The analysis and recommendations submitted in this report are based upon the data obtained from the one (1) soil boring performed at the location indicated on the Boring Location Plan. This report does not reflect any variations which may occur elsewhere on the site, the nature and extent of which may not become evident until during the course of construction. If variations are then identified, recommendations contained in this report should be re-evaluated after performing on-site observations.

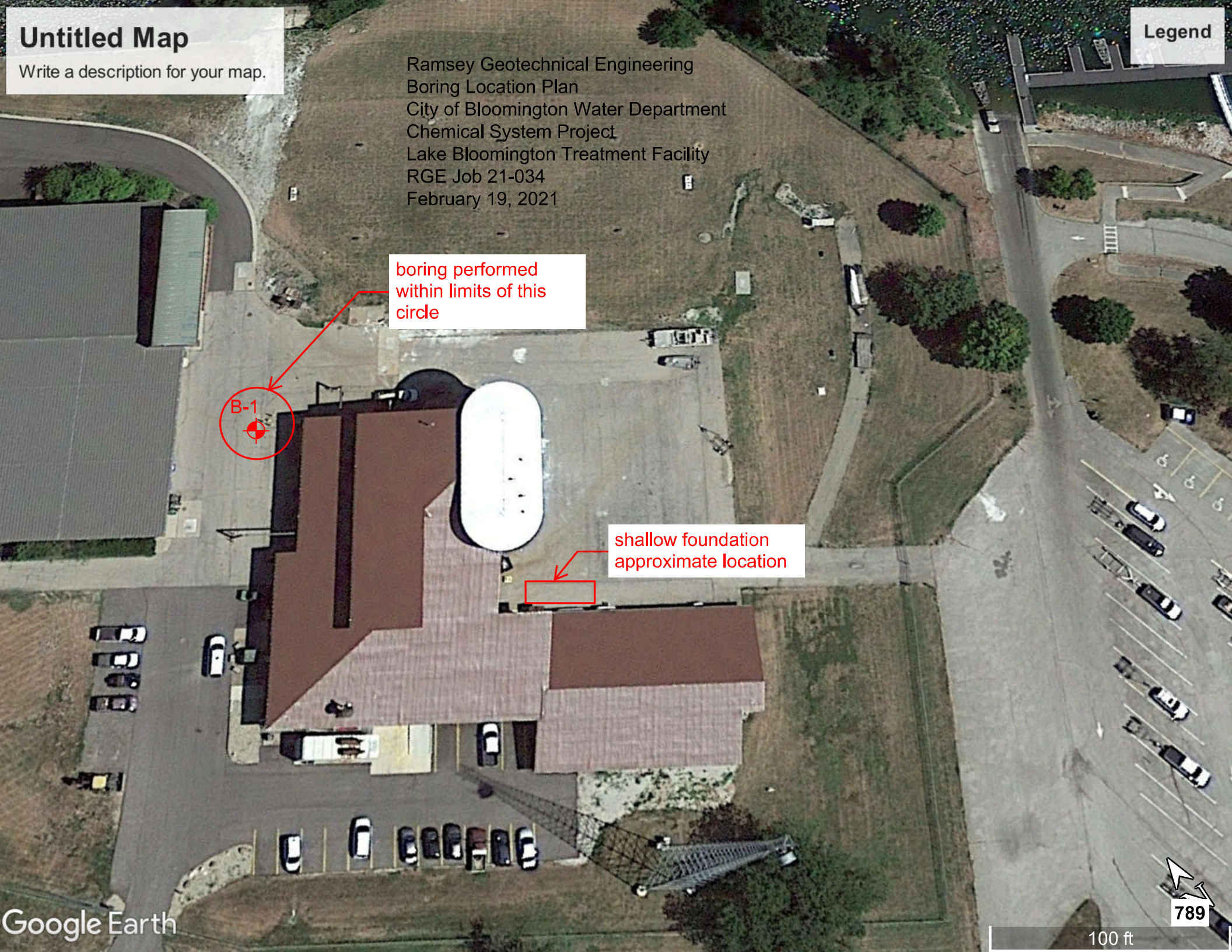
It has been a pleasure to assist you with this project. Please call if there are any questions or if we may be of further service.

Respectfully Submitted,

RAMSEY GEOTECHNICAL ENGINEERING LLC

Douglas P. Ramsey, P.E.
President

Attachments: Boring Location Plan
Boring Log B-1


Untitled Map
Write a description for your map.
Legend
Ramsey Geotechnical Engineering
Boring Location Plan
City of Bloomington Water Department
Chemical System Project
Lake Bloomington Treatment Facility
RGE Job 21-034
February 19, 2021
boring performed within limits of this circle
B-1
shallow foundation approximate location
Google Earth
789
100 ft

PROJECT **Chemical Systems Project, Lake Bloomington Facility, McLean County, IL**

CLIENT **City of Bloomington Water Dept., 603 W. Division St., Bloomington, IL 61701**

BORING **B-1** DATE STARTED **2-15-21** DATE COMPLETED **2-15-21** JOB **21-034**

ELEVATIONS

GROUND SURFACE **100.0**

END OF BORING **80.0**

WATER TABLE

▼ WHILE DRILLING **DRY**

▽ AT END OF BORING **DRY**

▼ 24 HOURS

DISTANCE BELOW SURFACE IN FEET

SAMPLE NO.	SAMPLE TYPE	LENGTH RECOVERY	N	WC	Qu	γ_{DRY}	DEPTH	ELEV.	SOIL DESCRIPTIONS
							0.6	99.4	Asphalt Pavement
									Aggregate Base
1	SS		41	14.3	1.0*		1.5	98.5	Stiff brown very silty CLAY, little sand (CL)
2	SS		12	17.0	0.5*		3.5	96.5	Soft brown very silty CLAY, little sand (CL)
3	SS		6	27.8	0.49 0.5*				
							8.0	92.0	Very loose brown clayey SILT, trace sand (ML)
4	SS		4	26.0					
							11.0	89.0	Medium dense brown fine to coarse SAND, trace silty clay (SP)
5	SS		26	7.5					
							13.0	87.0	Dense brown medium to coarse SAND and small to large GRAVEL (SP/GP)
6	SS		34	9.0					
							17.0	83.0	Hard gray silty CLAY, trace sand and gravel (CL)
7	SS		19	13.2	4.5+*				
									End of Boring at 20.0'

* Approximate unconfined compressive strength based on measurements with a calibrated pocket penetrometer.

DRILL RIG NO. **CME 55**

Division lines between deposits represent approximate boundaries between soil types; in-situ, the transition may be gradual.

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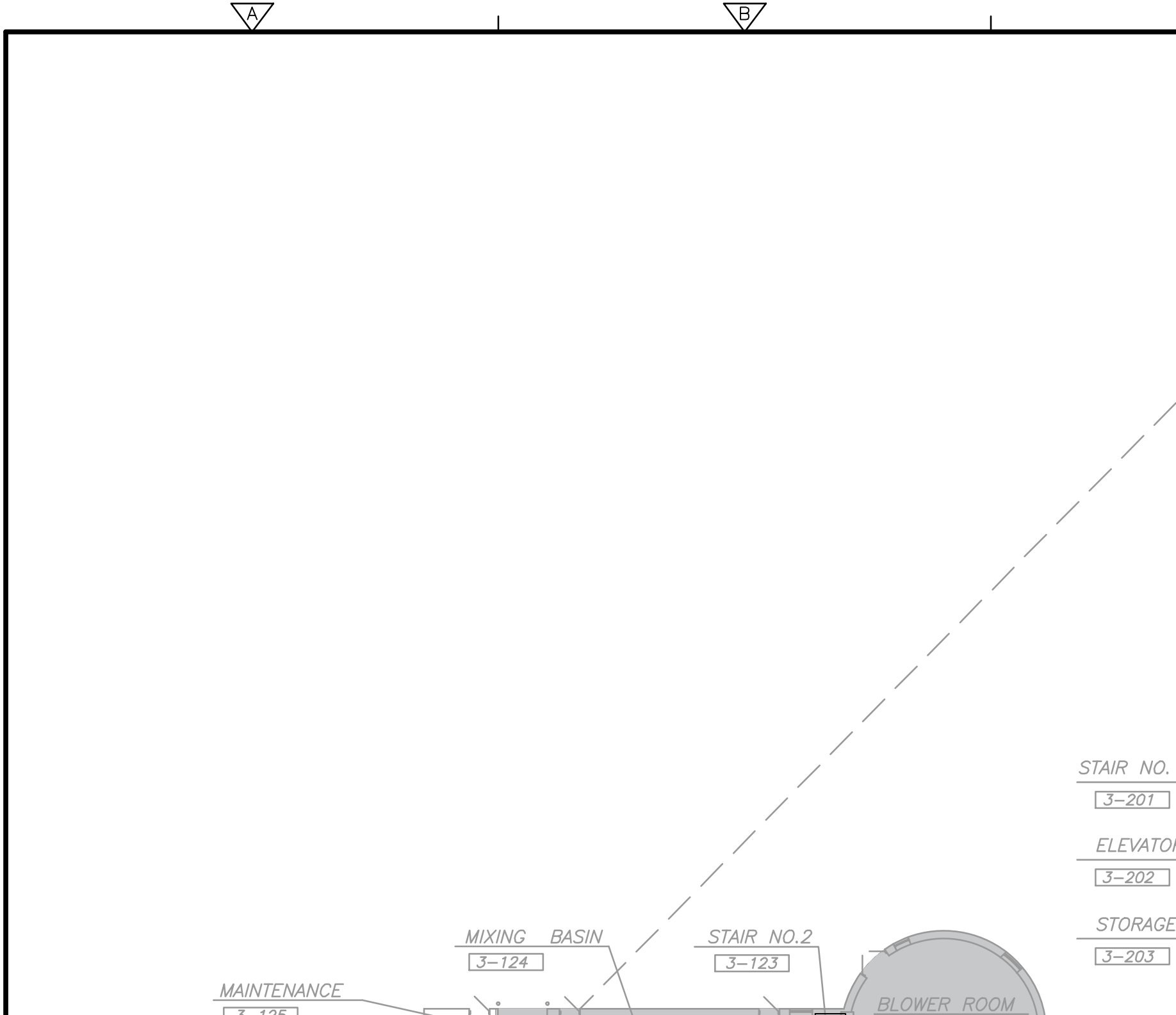
WAT
CHEMICA

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SHEET INDEX

SHEET	DRAWING NAME
GENERAL	
G–0	COVER SHEET
G–1	SHEET INDEX
G–2	AREA CLASSIFICATION
G–3	SITE PLAN
G–4	GENERAL NOTES
G–5	PROJECT ABBREVIATIONS AND LEGEND
G–6	AMMONIA SYSTEM DEMOLITION AND CONSTRUCTION PHASES 1 &
G–7	AMMONIA SYSTEM DEMOLITION AND CONSTRUCTION PHASES 3
MECHANICAL	
M–1	MECHANICAL LEGEND, SYMBOLS AND ABBREVIATIONS
M–2	AMMONIA SYSTEM PLAN AND ELEVATION
STRUCTURAL	
S–1	STRUCTURAL GENERAL NOTES ABBREVIATIONS AND LEGEND
S–2	STRUCTURAL PLANS AND SECTIONS
HVAC	
H–1	HVAC LEGEND, ABBREVIATIONS, GENERAL NOTES AND SCHEDULES

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GENERAL NOTES (ALL WORK REQUIRED BY THESE GENERAL NO

SURVEY AND SUBSURFACE UTILITIES

1. THE SURVEY FOR THIS PROJECT WAS PERFORMED BY RHMG ENGINEERING, UTILIZING FIELD SURVEY.
2. THE SURVEY INFORMATION PROVIDED ON THESE PLANS MAY OR MAY NOT SHOW ALL CURRENTLY EXISTING STRUCT UTILITIES ABOVE OR BELOW THE GROUND.
3. THE SURVEY INFORMATION CONTAINED ON THESE DRAWINGS MAY NOT SHOW OR INCLUDE LOCATION OF ALL EXISTI
4. CONSTRUCTION SURVEYING IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR PRIOR TO BEGINNING CONSTRUCTION

REGULATORY PERMITTING AND SAFETY

1. CONTRACTOR SHALL ABIDE BY ALL APPLICABLE GOVERNMENTAL AND REGULATORY STANDARDS AND REQUIREMENTS CONTRACTOR SHALL OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FOR CONSTRUCTION SHOWN DRAWINGS, CONTRACTOR SHALL ABIDE BY REQUIREMENTS OF CITY AND COUNTY PERMITS OBTAINED BY THE OWNER CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR ARRANGING AND COORDINATING ALL REQUIRED INSPECTIONS BY R AGENCIES INCLUDING PROVIDING ALL LABOR, EQUIPMENT AND MATERIALS NECESSARY TO ACCOMMODATE THE INSPE
2. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MAINTAINING SAFETY, INCLUDING GENERAL SAFETY AT AND ADJA WORK AREA, THE PERSONAL SAFETY OF THE CONSTRUCTION STAFF AND THE GENERAL PUBLIC, AND FOR THE SAF PUBLIC AND PRIVATE PROPERTY.
3. CONTRACTOR SHALL FOLLOW STORMWATER POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL AS IN THE CONTRACT DOCUMENTS

GENERAL AND CONSTRUCTION

1. THE CONTRACTOR SHALL VERIFY DIMENSIONS AND SITE CONDITIONS IN THE FIELD AND REPORT ANY DISCREPANCY ENGINEER PRIOR TO COMMENCING WORK.
2. THE CONTRACTOR SHALL TAKE ALL NECESSARY SAFETY PRECAUTIONS TO PROTECT ABUTTING PROPERTY, UTILITIES, AND VEHICULAR TRAFFIC TO THE SATISFACTION OF THE APPROPRIATE OWNER OR AUTHORITY.
3. CONTRACTOR SHALL NOT BLOCK ACCESS TO FIRE HYDRANTS, OR BUILDING FIRE SERVICE CONNECTIONS AT ANY TI THE PERFORMANCE OF THE WORK. ACCESS SHALL BE MAINTAINED AT ALL TIMES UNLESS OTHERWISE APPROVED B FIRE DEPARTMENT OR OTHER GOVERNING AGENCY.
4. MATERIAL OR EQUIPMENT SHALL NOT BE STORED ON OR RESTRICT ACCESS TO VALVE BOXES, MANHOLES, VAULTS, APPURTENANCES ASSOCIATED WITH OTHER UTILITY SYSTEMS.

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LEGEND

EXISTING FEATURES

- EXIST PROPERTY LINE
- EXIST RIGHT–OF–WAY LINE
- EXIST PROPERTY SETBACK
- EXIST SECTION LINE
- EXIST DEPRESSED CURB
- EXIST CHAIN–LINK FENCE
- EXIST WOOD FENCE
- EXIST WIRE FENCE
- EXIST WROUGHT IRON FENCE
- EXIST STORM LINE
- EXIST SANITARY LINE
- W — EXIST WATERMAIN LINE
- G — EXIST UNDERGROUND GAS
- E — EXIST UNDERGROUND ELECTRICAL
- TS — EXIST UNDERGROUND TRAFFIC SIGNAL
- T — EXIST UNDERGROUND TELEPHONE
- TV — EXIST UNDERGROUND CABLE TV
- OH — EXIST OVERHEAD WIRES
- LA — EXIST LANDSCAPE AREA
- EXIST GUARD RAIL
- Ⓜ EXIST MISCELLANEOUS MANHOLE (MH)
- EXIST STORM INLET (INL)
- EXIST FLARED END SECTION
- DS EXIST DOWN SPOUT

- 8" EXIST DECIDUOUS TREE WI
  TRUNK DIAMETER IN INC
- 8" EXIST CONIFEROUS TREE W
  TRUNK DIAMETER IN INC
- EXIST MULTI–TRUNK TREE
  POINT NUMBER
- EXIST BITUMINOUS PAVEMEI
- EXIST CONCRETE
- EXIST AGGREGATE
- EXIST BRICK

PROPOSED FEATURES–PLAN

- PROPOSED CONTRACTOR LA
  AREAS AND JACK & BORE
- REMOVAL HATCH
- FLOW ARROW

PHOTO LOCATION AND DIRECTION

1 — PHOTO NUMBER

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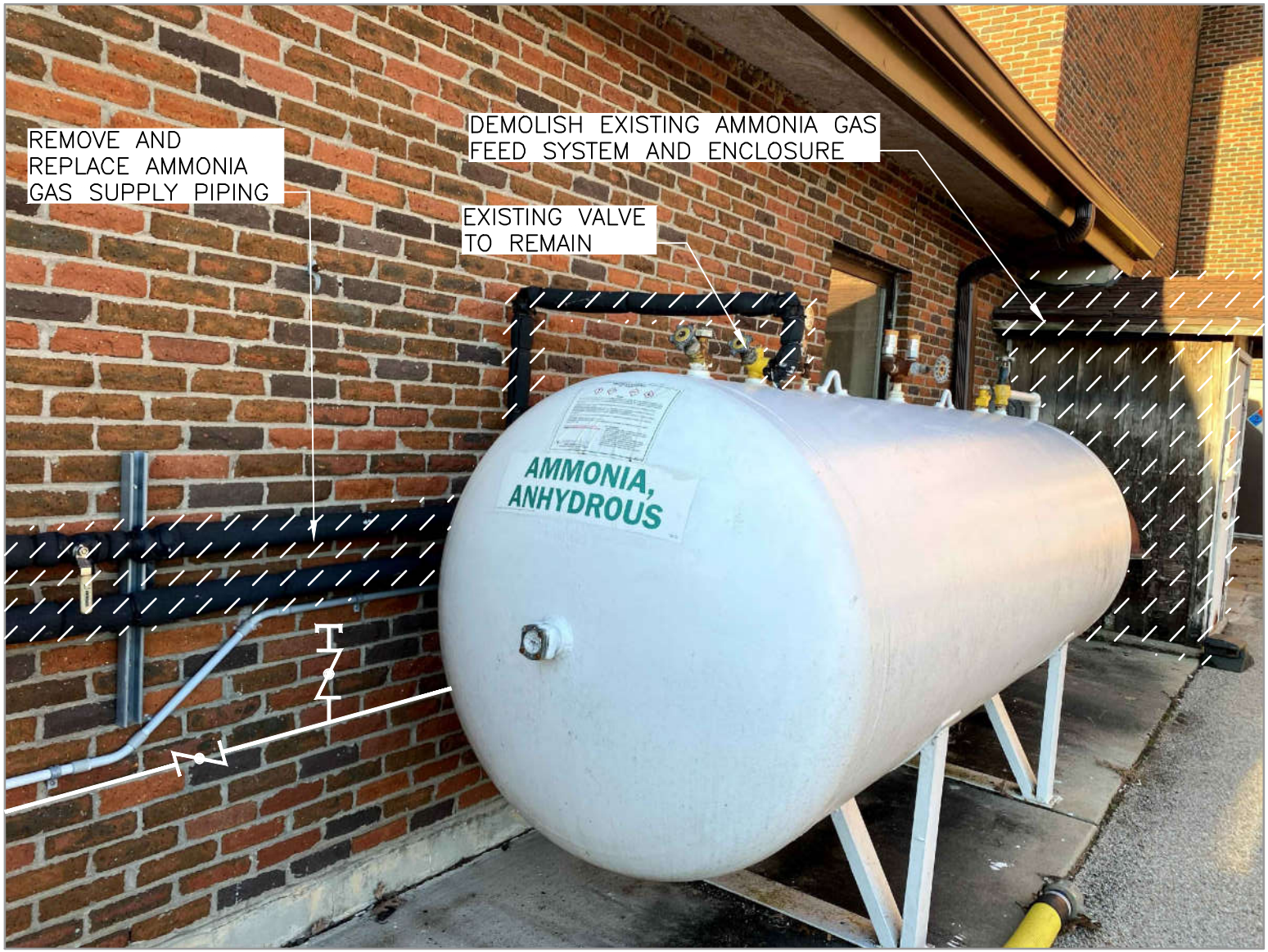
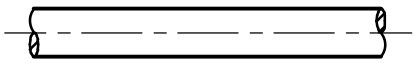
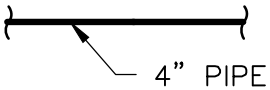
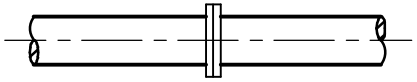
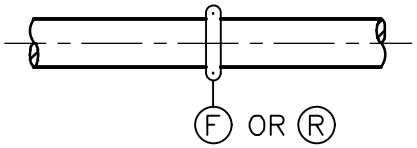
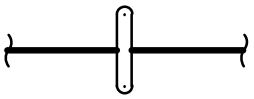
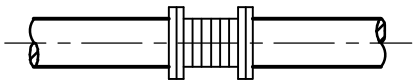
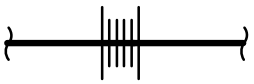
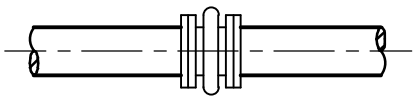
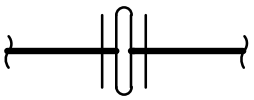
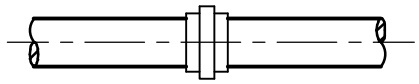
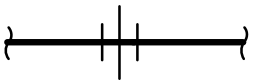
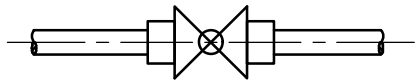
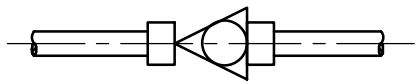
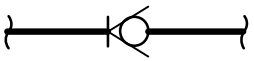


PHOTO 6

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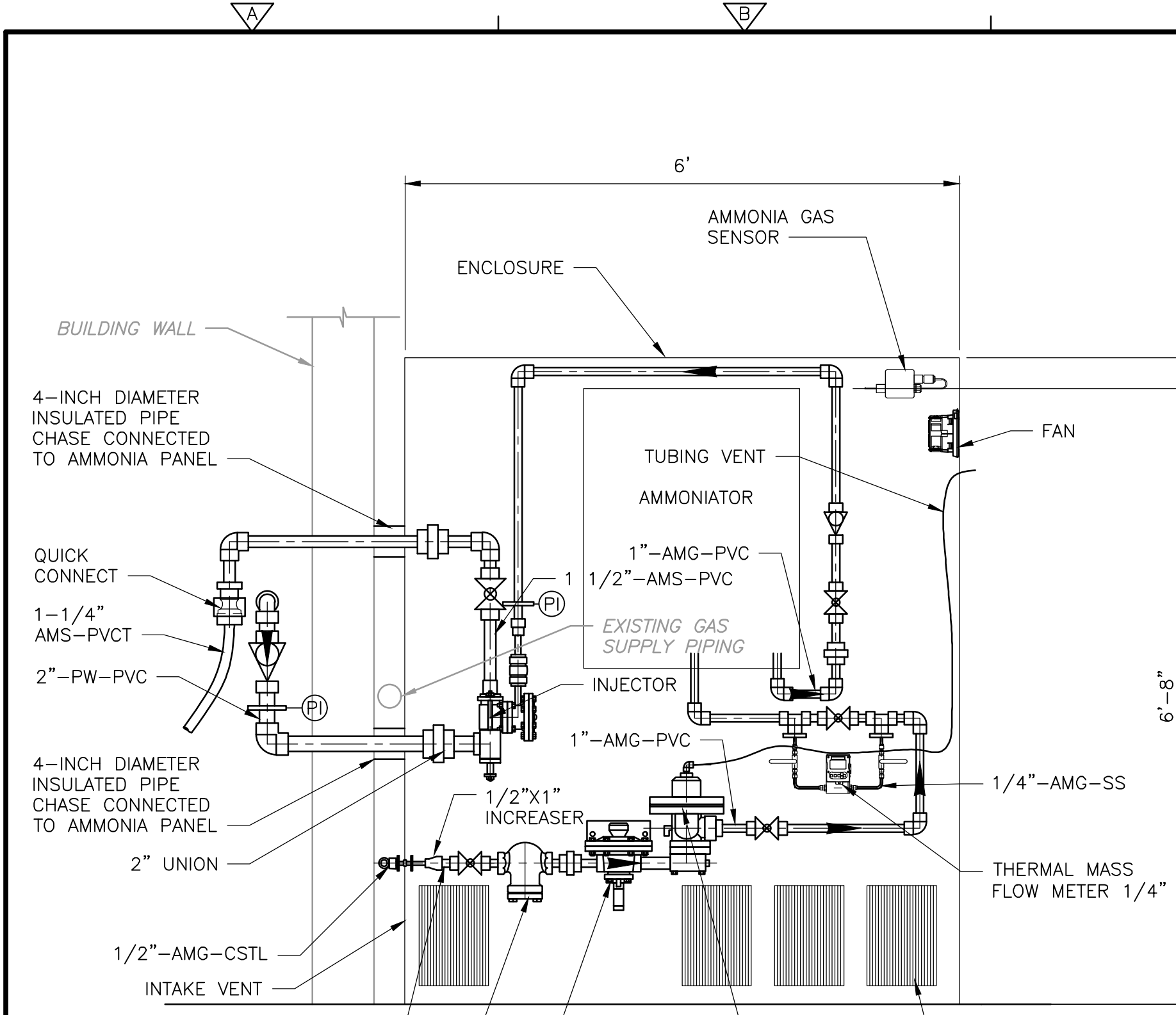
A B

PIPE, FITTING AND VALVE SYMBOLS

DOUBLE LINE SYMBOL	SINGLE LINE SYMBOL	FEATURE
		PROCESS PIPING 4" PIPE AND SMALLER ON PLAN VIEWS
		EXISTING PROCESS PIPING
		FLANGED JOINT (SEE NOTE 1)
		COUPLING FOR GROOVED END JOINTS: Ⓕ FLEXIBLE Ⓡ RIGID
		FLEXIBLE COUPLING OR EXPANSION JOINT (SLEEVE TYPE)
		FLEXIBLE COUPLING OR EXPANSION JOINT (BELLOWS TYPE)
		UNION COUPLING
		BALL VALVE (BV)
		BALL CHECK VALVE (BCV)

Ⓕ OR Ⓡ

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STRUCTURAL NOTES

A. GENERAL NOTES

1. ALL STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH THE OTHER PROJECT DRAWINGS AND SPECIFICATIONS.

2. SEE CIVIL, ELECTRICAL, ARCHITECTURAL, PLUMBING AND HVAC DRAWINGS FOR ANCHORS, PIPE SLEEVES, CONDUITS, DOORS, WINDOWS, LOUVERS, DUCTWORK OR OTHER ITEMS TO BE EMBEDDED IN OR PASS THROUGH THE CONCRETE OR MASONRY. IN GENERAL, EMBEDMENTS AND PENETRATIONS LESS THAN 12 INCHES IN DIAMETER ARE NOT SHOWN ON STRUCTURAL DRAWINGS.

3. THE CONTRACTOR SHALL REVIEW AND VERIFY DIMENSIONS SHOWN IN ALL PLANS AND REVIEW ALL FIELD CONDITIONS THAT MAY AFFECT THE INSTALLATION OF THE STRUCTURE, SHOULD DISCREPANCIES APPEAR, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING TO OBTAIN ENGINEER'S CLARIFICATION BEFORE COMMENCING THE WORK.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR STRUCTURAL STABILITY DURING CONSTRUCTION. THE STRUCTURE SHOWN ON THE DRAWINGS HAS BEEN DESIGNED FOR STABILITY UNDER THE FINAL CONFIGURATION ONLY.

5. WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALED SIZES.

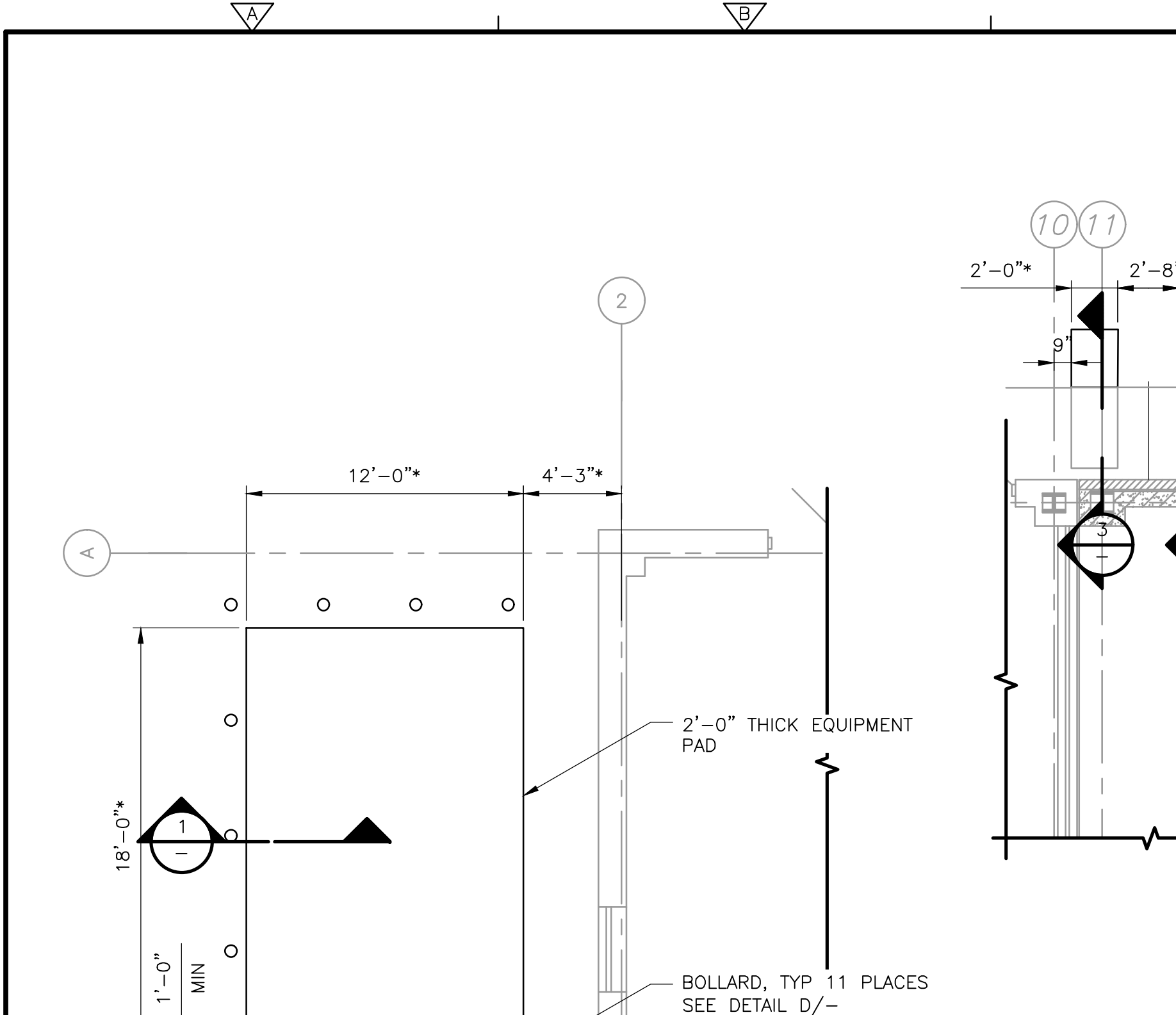
B. DESIGN CRITERIA

1. BUILDING CODES:
   a. 2018 INTERNATIONAL BLDG CODE, ASCE 7-16
   b. ACI 318-14

2. WIND LOADS:
   BASIC WIND SPEED = 120 MPH
   EXPOSURE CATEGORY = C
   IMPORTANCE FACTOR = 1.0

3. SEISMIC LOADS:
   RISK CATEGORY OF BUILDING II
   SEISMIC DESIGN CATEGORY = B
   SOIL SITE CLASS = D
   IMPORTANCE FACTOR = 1.00
   Ss = 0.147; S1 = 0.082
   Sds = 0.156; Sd1 = 0.131

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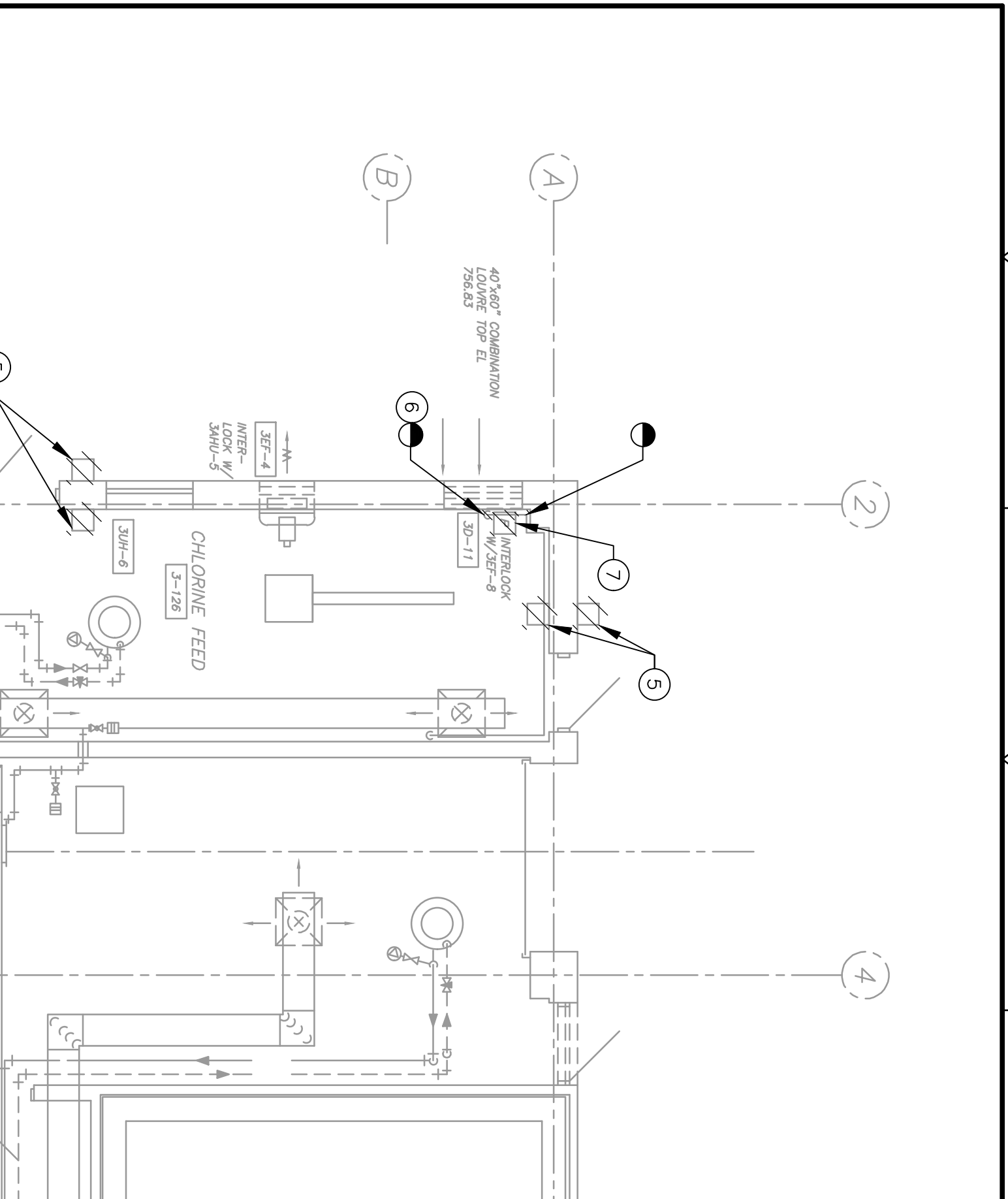
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LEGEND

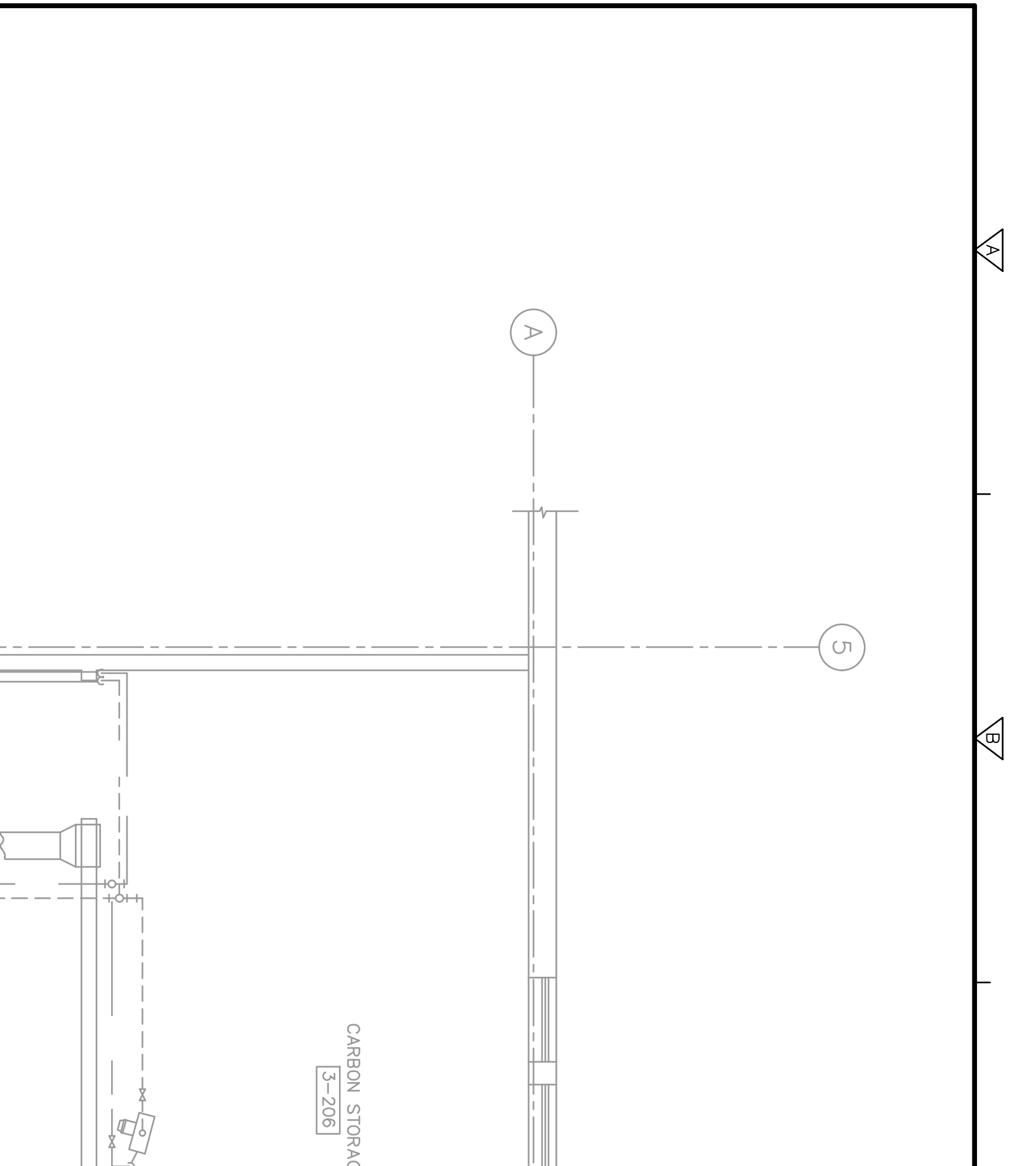
SINGLE LINE	DOUBLE LINE	
20X12	20X12	FIRST DIMENSION DENOTES VIEW SHOWN; RECT. OR OVAL
		TRANSITION, 18" MIN. LENGTH, 15° MAX. EACH SIDE. ROUND OR RECT.
		RECT. TO ROUND TRANSITION
		90° ELL W/TURNING VANES
		45° HEEL TAKE–OFF FITTING, RECT.
		CONICAL OR FLARED SPIN–IN OR CONICAL TAP
18ø	18ø	18 INCH ROUND DUCT
	D R	ROUND DUCT ELBOW; R/D=1.5MIN.
		90° STRAIGHT TEE FITTING
		90° CONICAL TEE FITTING
		45° LATERAL FITTING
		45° CONICAL LATERAL FITTING
		DIVIDED FLOW FITTING

ACC	AIR COOL
ACH	AIR CHAN
ACU	AIR COND
AFF	ABOVE FIN
AL	ALUMINUM
ATC	AUTOMATIC
BD	BALANCIN
BDD	BACKDRAF
BHP	BRAKE HO
BI	BACKWARD
BOD	BOTTOM O
BTUH	BRITISH T
CD	CONDENSA
CFH	CUBIC FE
CFM	CUBIC FE
CU. FT.	CUBIC FE
DB	DRY BULE
DIA	DIAMETER
DIV	DIVISION
DN	DOWN
EA	EXHAUST
EAT	ENTERING
EF	EXHAUST
EG	EXHAUST
ESD	EMERGENC
ESP	EXTERNAL
EUH	ELECTRIC
°F	DEGREES
FD	FIRE DAM

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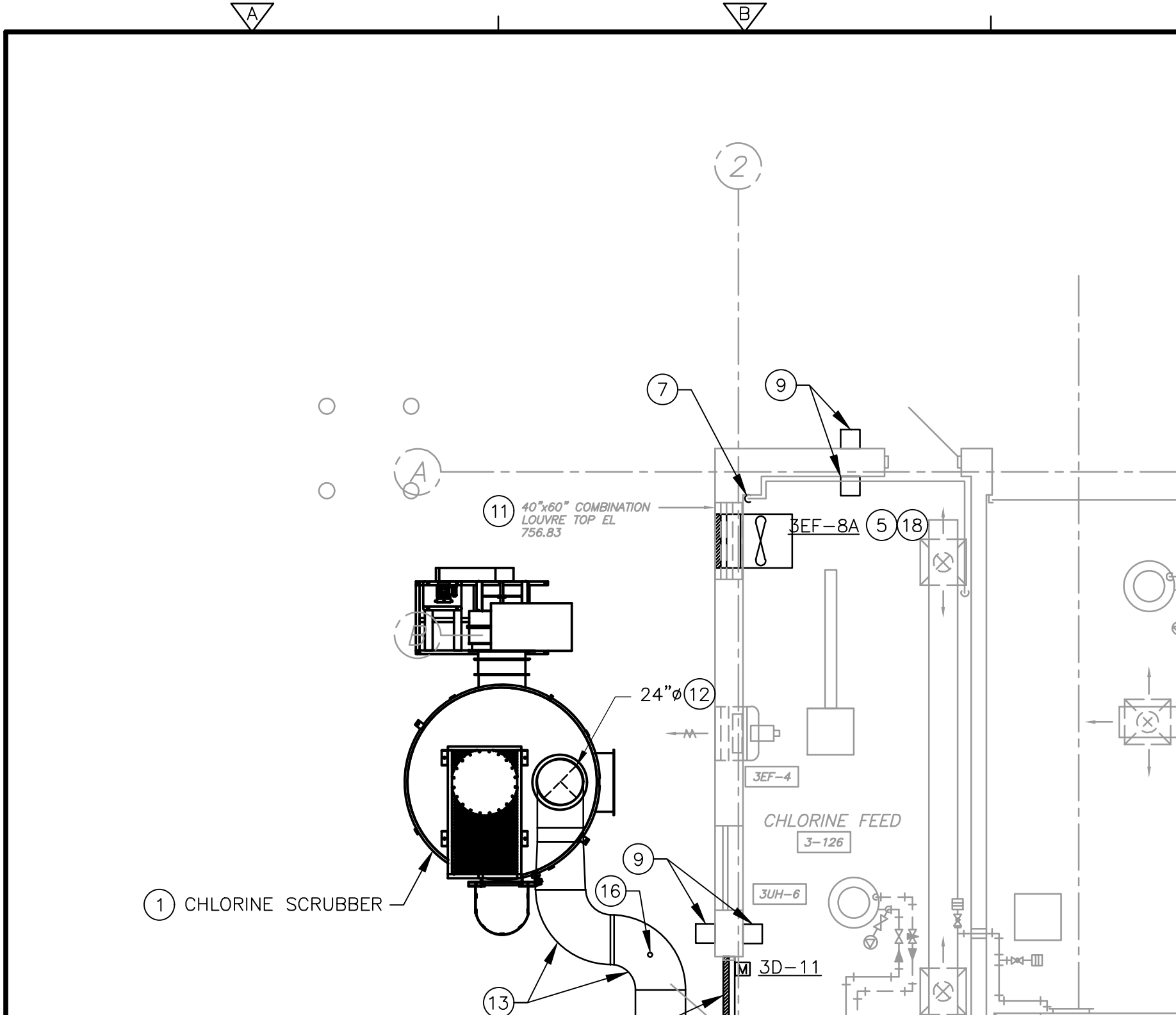


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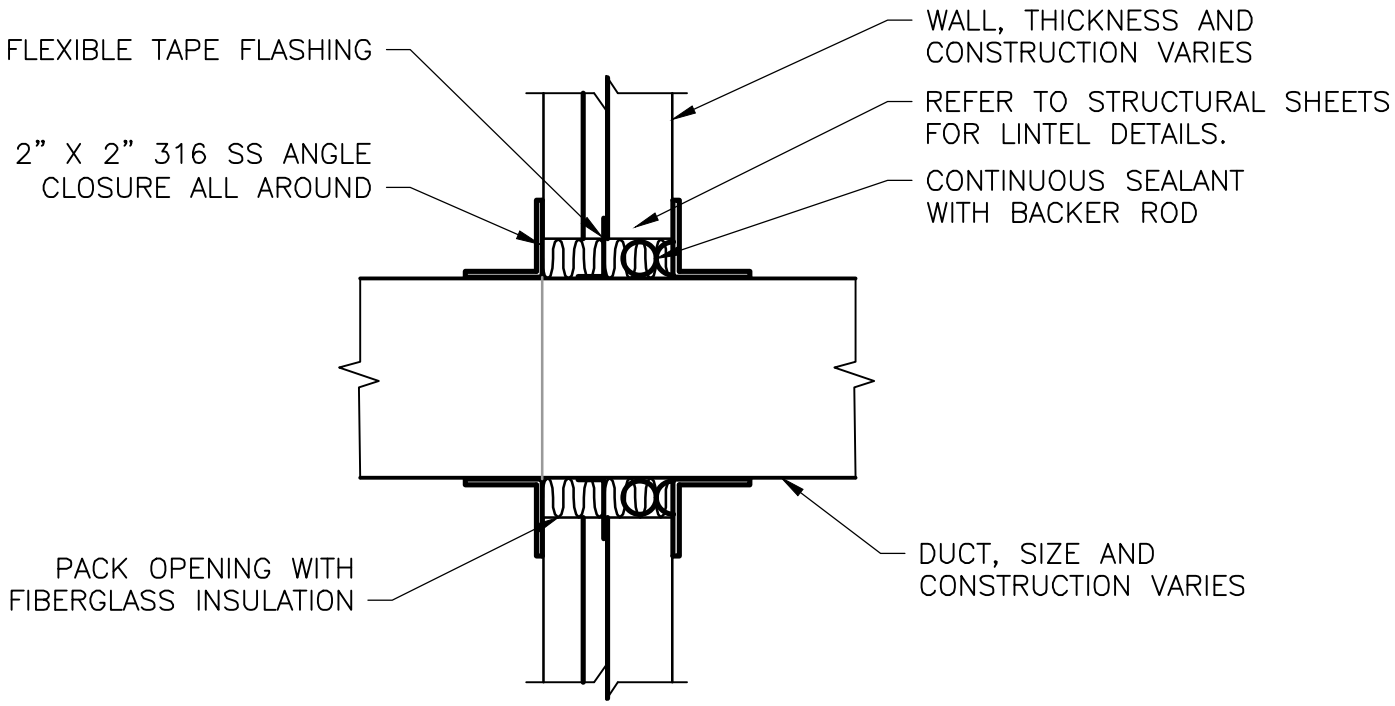


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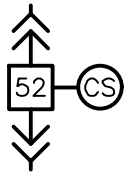
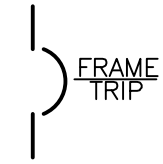
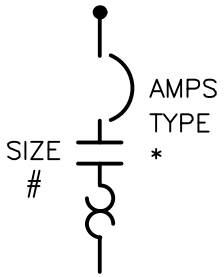
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DUCT WALL PENETRATIONS TO BE USED FOR ALL EXTERIOR NON-FIRE RATED WA

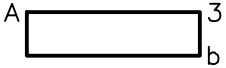
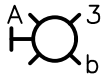
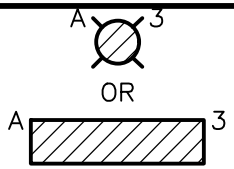
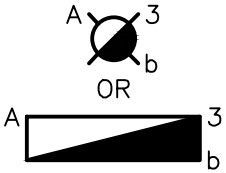
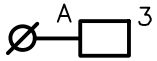
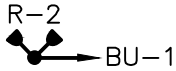
DETAIL A

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ONE LINE OR CONTROL DIAGRAM	PLAN	DESCRIPTION
	——	MEDIUM VOLTAGE DRAWOUT TYPE POWER CIRCUIT BREAKER CS=CONTROL SWITCH
	CB	LOW VOLTAGE AIR OR MOLDED CASE CIRCUIT BREAKER, 3 POLE UNLESS OTHERWISE NOTED.
		COMBINATION MOTOR CIRCUIT PROTECTOR AND MAGNETIC MOTOR STARTER, FULL VOLTAGE NON–REVERSING UNLESS OTHERWISE NOTED: * FVR – FULL VOLTAGE REVERSING RVNR – REDUCED VOLTAGE NON–REVERSING RVAT – REDUCED VOLTAGE AUTOTRANSFORMER RVSS – REDUCED VOLTAGE SOLID STATE 2S1W – TWO SPEED, ONE WINDING 2S2W – TWO SPEED, TWO WINDING (DIAGRAMMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)
		NON–FUSIBLE DISCONNECT SWITCH, 600 VOLT, 3 POLE * AMPERE RATING NOTED IF OTHER THAN 30A (DIAGRAMMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)
	F	FUSIBLE DISCONNECT SWITCH, 600 VOLT, 3 POLE, * AMPERE RATING AND FUSE SIZE AS NOTED ✸ AMPERE RATING NOTED IF OTHER THAN 30A FUSE RATING (DIAGRAMMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)
		MANUAL MOTOR STARTER WITH THERMAL OVERLOAD HEATER, 1 POLE UNLESS OTHERWISE NOTED "P" INDICATES WITH PILOT LIGHT "2" INDICATES TWO POLE (DIAGRAMMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)

ONE LINE OR CONTROL DIAGRAM	PLAN
	——
	

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SYMBOL	DESCRIPTION
	LIGHTING FIXTURE "A" – FIXTURE TYPE (SEE LIGHTING FIXTURE SCHEDULE) "b" – CONTROLLED BY SWITCH "b" "3" – CIRCUIT NUMBER
	LIGHTING FIXTURE, NOTATIONS SAME AS ABOVE
	WALL MOUNTED TYPE LIGHTING FIXTURE, NOTATIONS SAME AS ABOVE
	CROSS HATCH INDICATES LIGHTING FIXTURE THAT IS UNSWITCHED AND SHALL REMAIN ON AT ALL TIMES. NOTATIONS SAME AS ABOVE.
	SHADED AREA INDICATES LIGHTING FIXTURE THAT IS EQUIPPED WITH EMERGENCY BACKUP POWER SOURCE. NOTATIONS SAME AS ABOVE.
	POLE MOUNTED AREA TYPE LIGHTING FIXTURE, NOTATIONS SAME AS ABOVE
	POLE MOUNTED ROADWAY TYPE LIGHTING FIXTURE, NOTATIONS SAME AS ABOVE
	EMERGENCY LIGHTING BATTERY UNIT WITH TWO LAMP HEADS "EM" – FIXTURE TYPE (SEE LIGHTING FIXTURE SCHEDULE) "3" – SUPERVISORY CIRCUIT * – FIXTURE TAG #
	REMOTE EMERGENCY ADJUSTABLE WALL LIGHTING FIXTURE WITH TWO LAMP HEADS "R–2" – FIXTURE TYPE (SEE LIGHTING FIXTURE SCHEDULE) * – HOME RUN TO BATTERY UNIT INDICATED. CONDUIT SHALL BE 3/4" AND CONTAIN (2) NO. 12 AWG BRANCH CIRCUIT CONDUCTORS AND (1) NO. 12 AWG GROUND CONDUCTOR UNLESS OTHERWISE INDICATED.

SYMBOL	
$\$_a$	SINGLE POLE SW
$\$_a^2$	DOUBLE POLE S
$\$_c^3$	THREE WAY SWIT
$\$_a^4$	FOUR WAY SWITC
$\$_a^D$	DIMMER SWITCH
$\$_{OS}$	SINGLE POLE SWIT "OS" INDICATES A
$\$_{OS}^2$	DOUBLE POLE SWI "OS" INDICATES PR INBOARD/OUTBOAR
$\$_{DT}$	SINGLE POLE SWIT "DT" INDICATES DU CAPABLE OF SENS
C 3	LIGHTING CONTAC
TM	TIME SWITCH
	PUSH BUTTON S
TYPE A	INDICATES ALL L WHICH THIS NOT OTHERWISE NOTE
	LIGHTING PANELE SHOWN ON PLAN
	POWER PANELBO SHOWN ON PLAN
	LIGHTING CONTAC SHOWN ON PLAN

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SCOPE OF WORK:

1. PROJECT PROVIDES ELECTRICAL SYSTEM UPGRADES ASSOCIATED WITH THE NEW CHLORINE SCRUBBER SYSTEM AND NEW AMMONIA FEED SYSTEM AT THE CITY OF BLOOMINGTON WATER TREATMENT PLANT. MAJOR IMPROVEMENTS INCLUDE, BUT ARE NOT LIMITED TO, NEW CONDUIT AND WIRING (POWER AND CONTROL) FOR THE NEW CHLORINE SCRUBBER AND AMMONIA FEED SYSTEM, AND MODIFICATIONS TO THE EXISTING MOTOR CONTROL CENTERS.

2. PROVIDE CONDUIT, WIRE, AND TERMINATIONS FOR MOTORS, MOTOR CONTROLLERS, CONTROL DEVICES, CONTROL PANELS, AND ELECTRICAL EQUIPMENT FURNISHED BY OTHER DIVISIONS.

3. PROVIDE CONDUIT, WIRE, AND TERMINATIONS (INCLUDING SURGE PROTECTION TERMINATIONS) FOR FIELD–MOUNTED INSTRUMENTS FURNISHED AND MOUNTED BY OTHER DIVISIONS.

4. PROVIDE CONDUIT, WIRE, AND TERMINATIONS FOR SCADA SYSTEM COMPONENTS, INCLUDING PLC CABINETS.

GENERAL NOTES:

1. ELECTRICAL DRAWINGS ARE INTENDED TO SHOW THE GENERAL LAYOUT OF WORK TO BE INSTALLED UNDER THIS CONTRACT WI ATTEMPTING TO SHOW ALL DETAILS. FURNISH LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS REQUIRED FOR A COMPLETE A OPERATIONAL ELECTRICAL SYSTEM AS SHOWN ON THE CONTRACT DOCUMENTS.

2. COORDINATE WORK WITH OTHER TRADES AND THE OWNER.

3. MAINTAIN EXISTING PROCESS OPERATIONS. POWER INTERRUPTIONS TO ELECTRICAL EQUIPMENT SHALL BE AT OWNER'S CONVENI 72 HOURS MINIMUM NOTICE. EACH INTERRUPTION SHALL HAVE PRIOR WRITTEN APPROVAL.

4. CONTRACTOR'S WORK SHALL INCLUDE COMPLETE TESTING OF EQUIPMENT AND WIRING INCLUDING MAKING MINOR CORRECTIONS OR ADJUSTMENTS NECESSARY FOR THE PROPER FUNCTIONING OF THE SYSTEM AND EQUIPMENT. WORKMANSHIP SHALL BE OF HIGHEST QUALITY; SUBSTANDARD WORK WILL BE REJECTED.

5. DO NOT SCALE ELECTRICAL DRAWINGS. REFER TO MECHANICAL, STRUCTURAL DRAWINGS, AND APPROVED MANUFACTURER'S SHO DRAWINGS FOR EXACT LOCATION OF EQUIPMENT. EXCEPT WHERE DIMENSIONS ARE SHOWN, LOCATIONS OF EQUIPMENT, FIXTUR OUTLETS, AND SIMILAR DEVICES ARE APPROXIMATE.

6. WORK SHALL COMPLY WITH NEC AND LOCAL CODES.

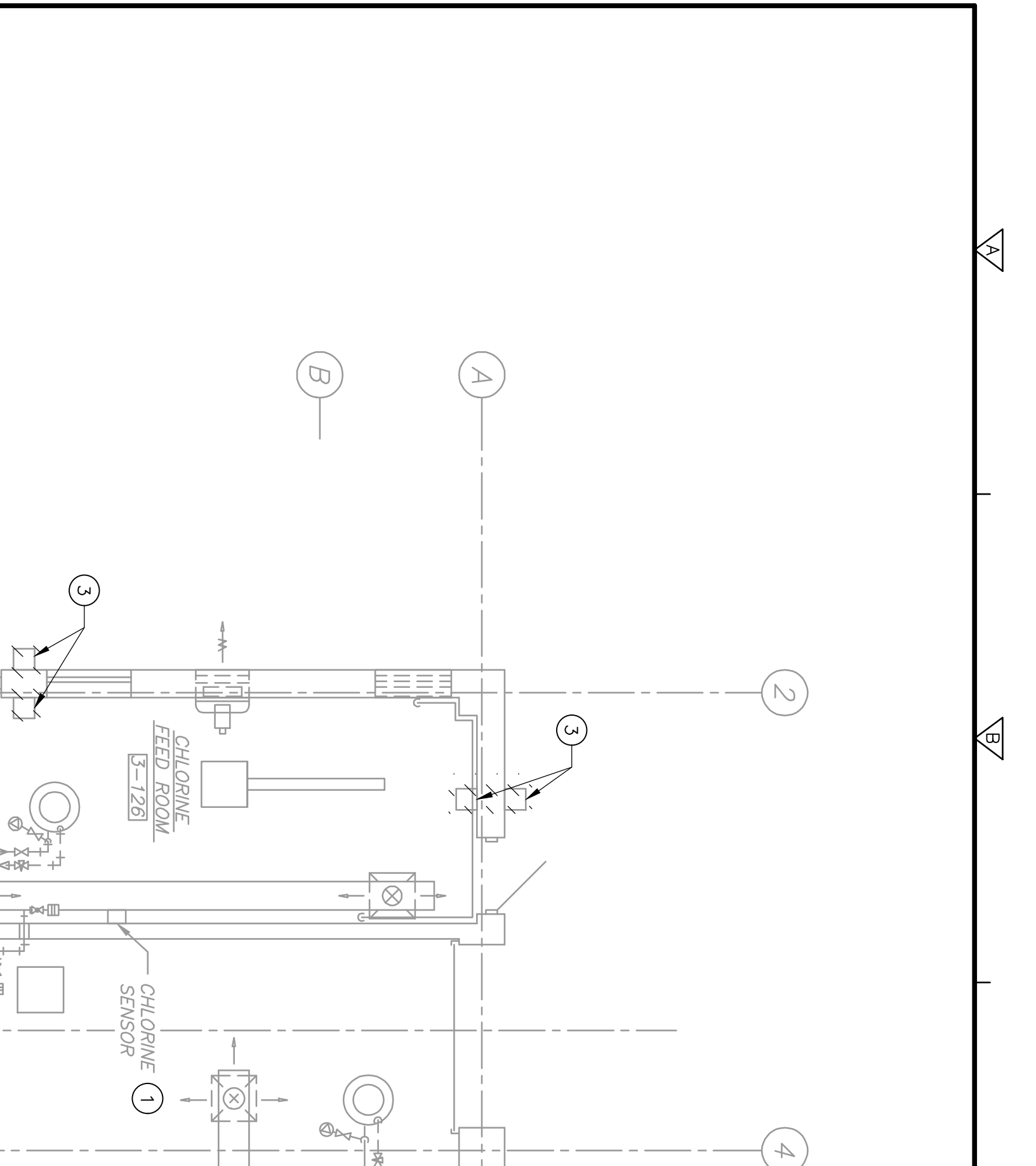
7. DO NOT SPLICE CONDUCTORS EXCEPT AS NOTED.

8. POWER AND CONTROL CONDUITS SHALL HAVE AN EQUIPMENT GROUNDING CONDUCTOR WIRE SIZED PER TABLE 250.122 OF TH (UON).

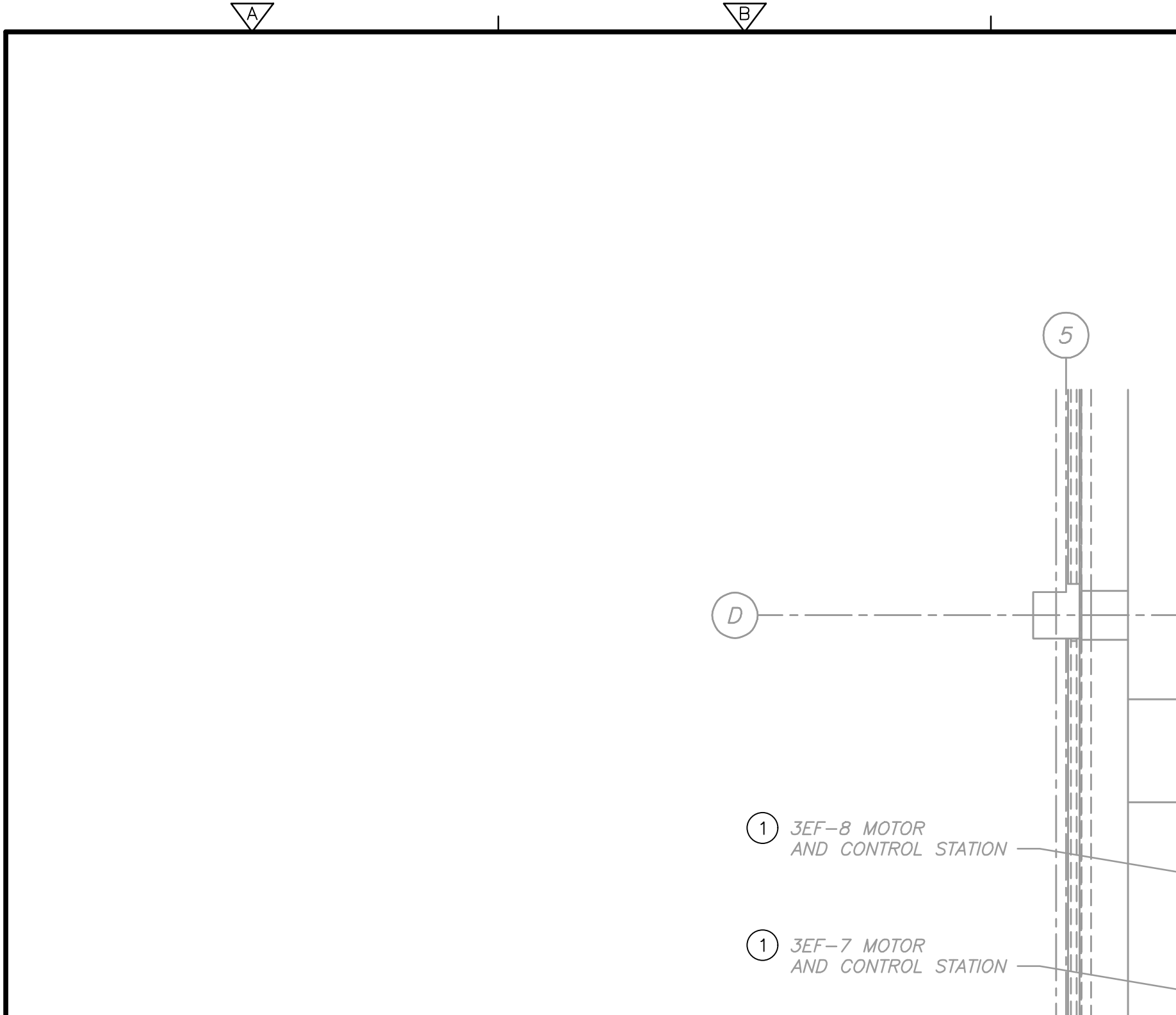
9. COORDINATE SEQUENCE OF CONSTRUCTION WITH CIVIL, MECHANICAL, AND STRUCTURAL DISCIPLINES. PROVIDE TEMPORARY POW CONTROL CIRCUITS AS REQUIRED TO MAINTAIN FACILITY OPERATION. VERIFY EXISTING UTILITIES IN AREA OF CONSTRUCTION.

10. CONDUITS RUN AT EXISTING STRUCTURES SHALL BE RUN EXPOSED.

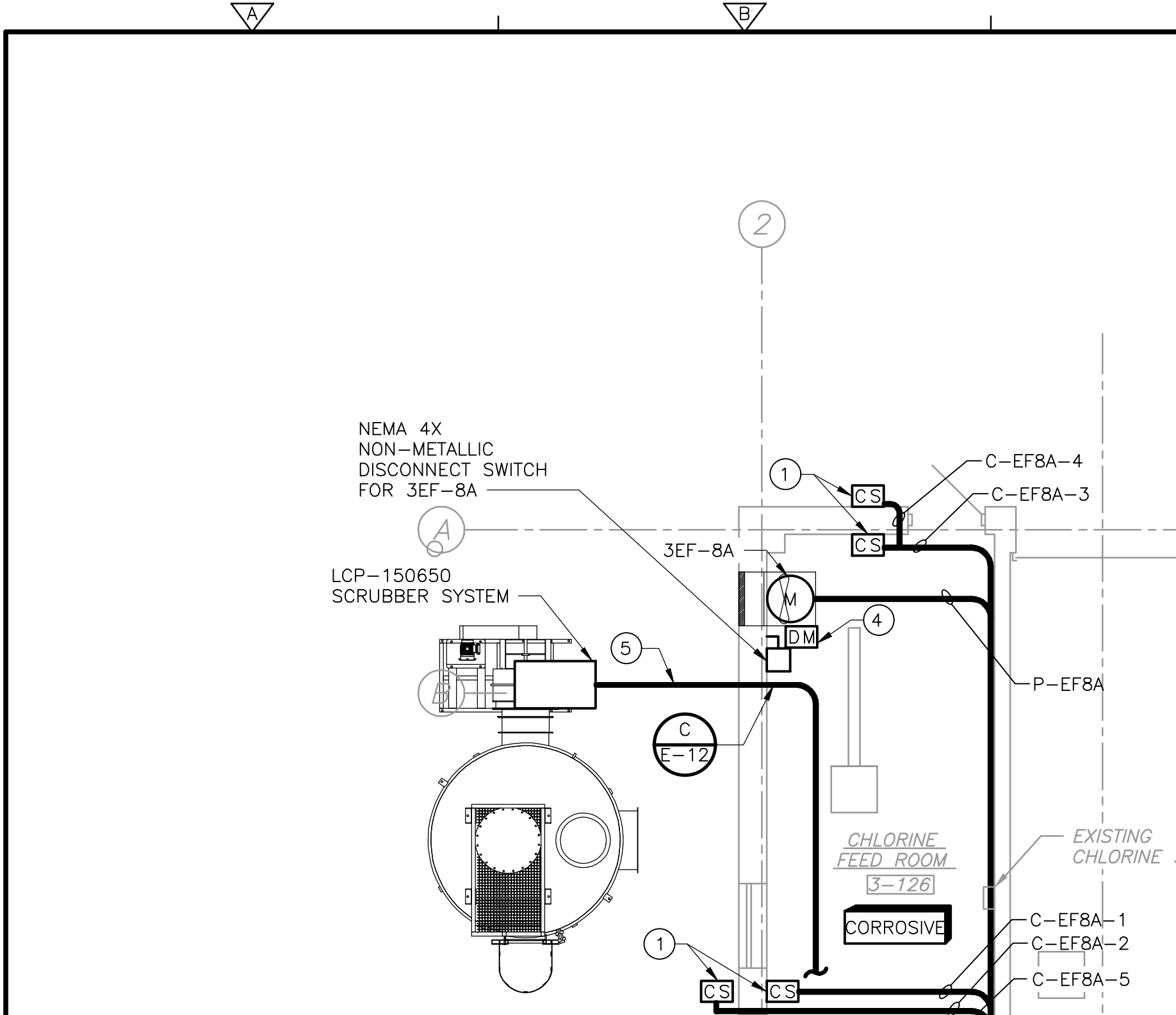
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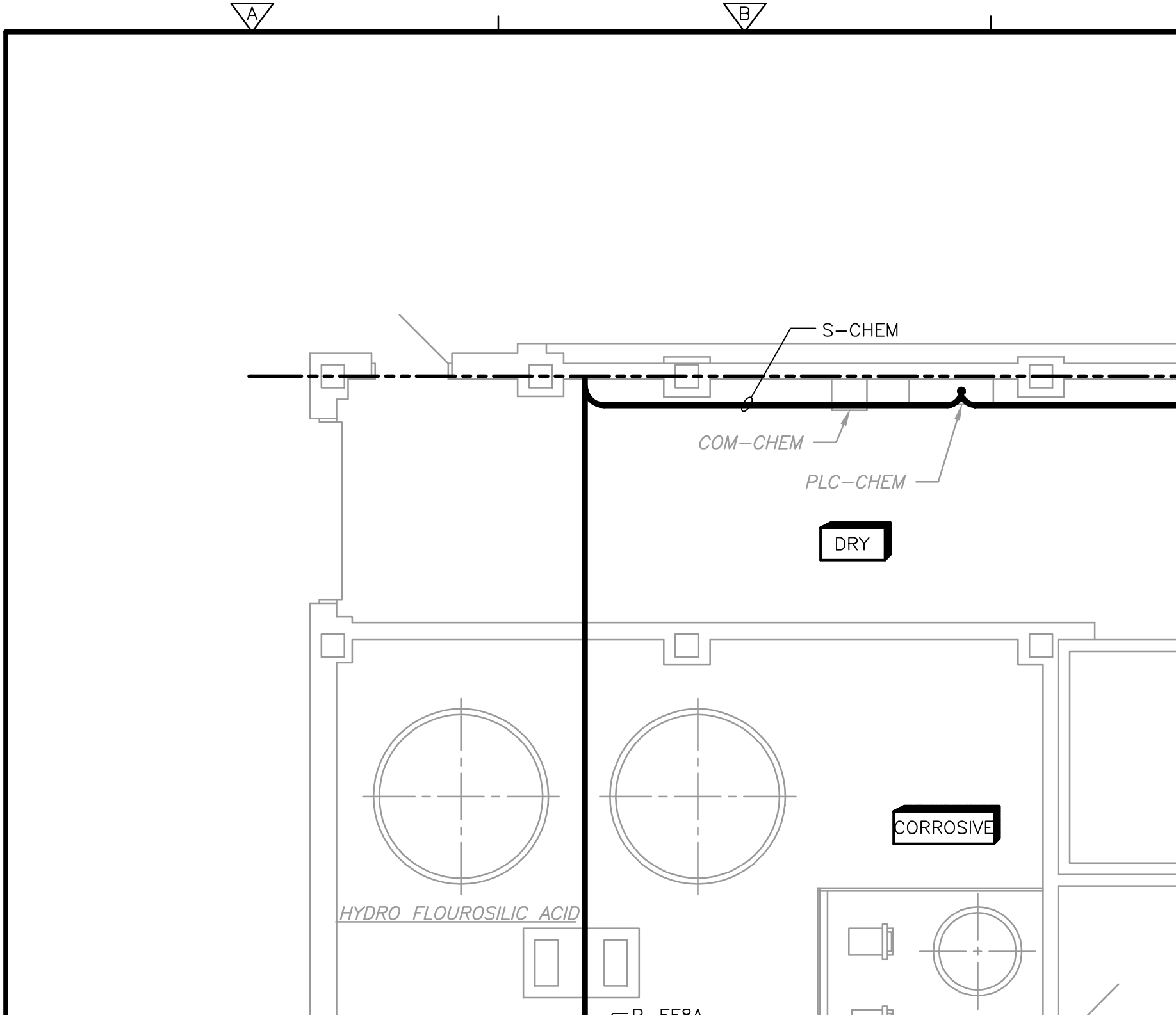
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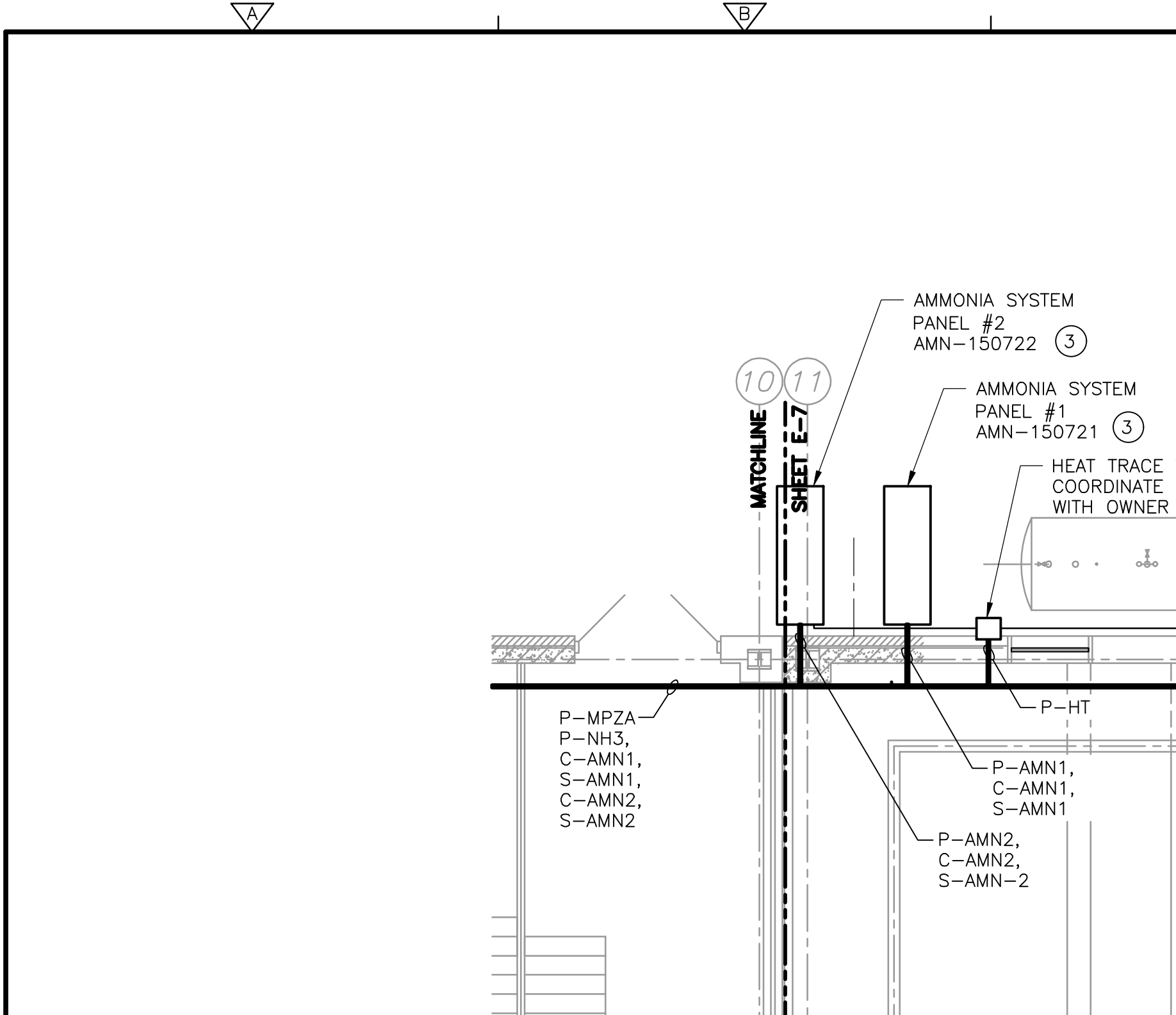
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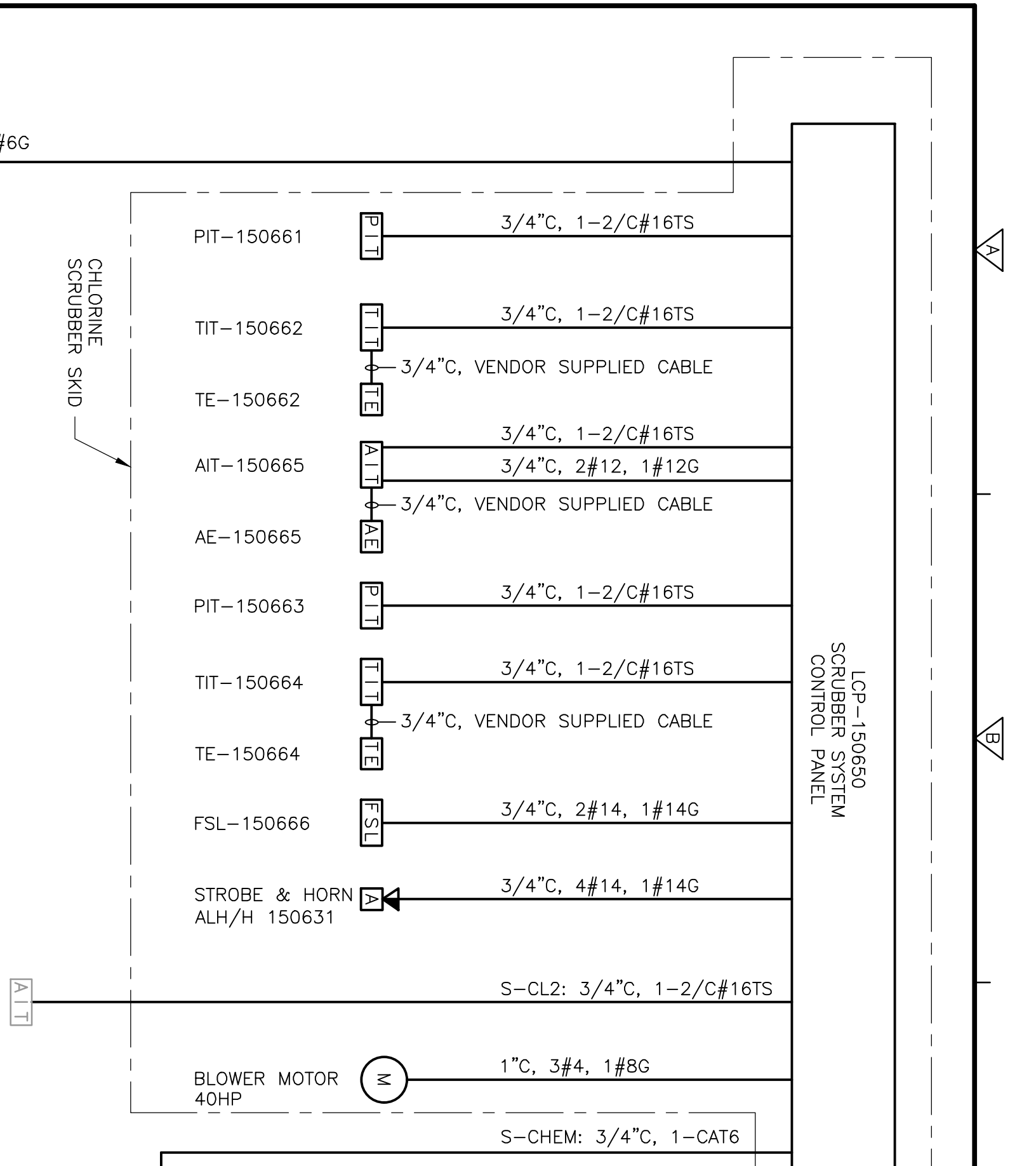
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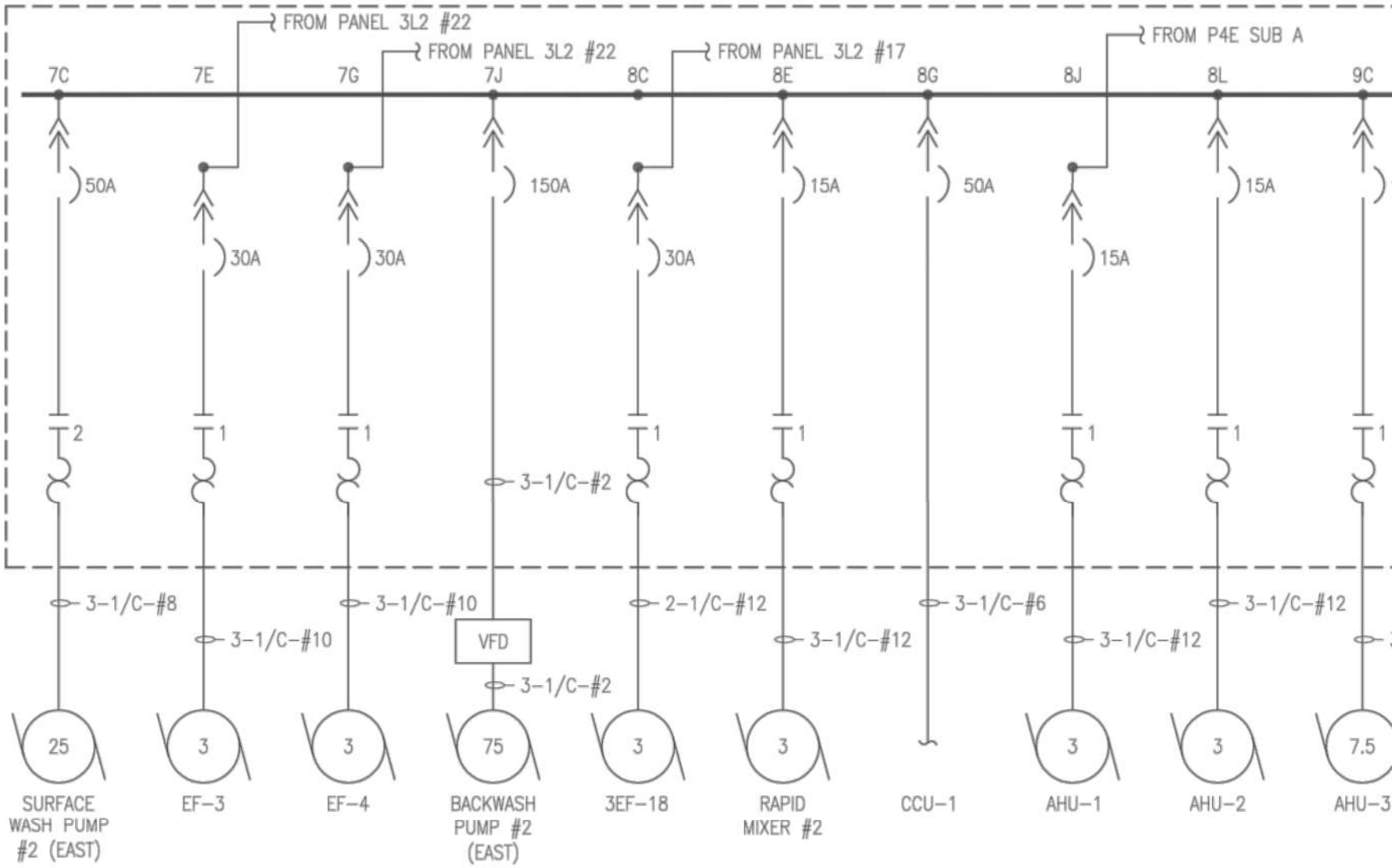
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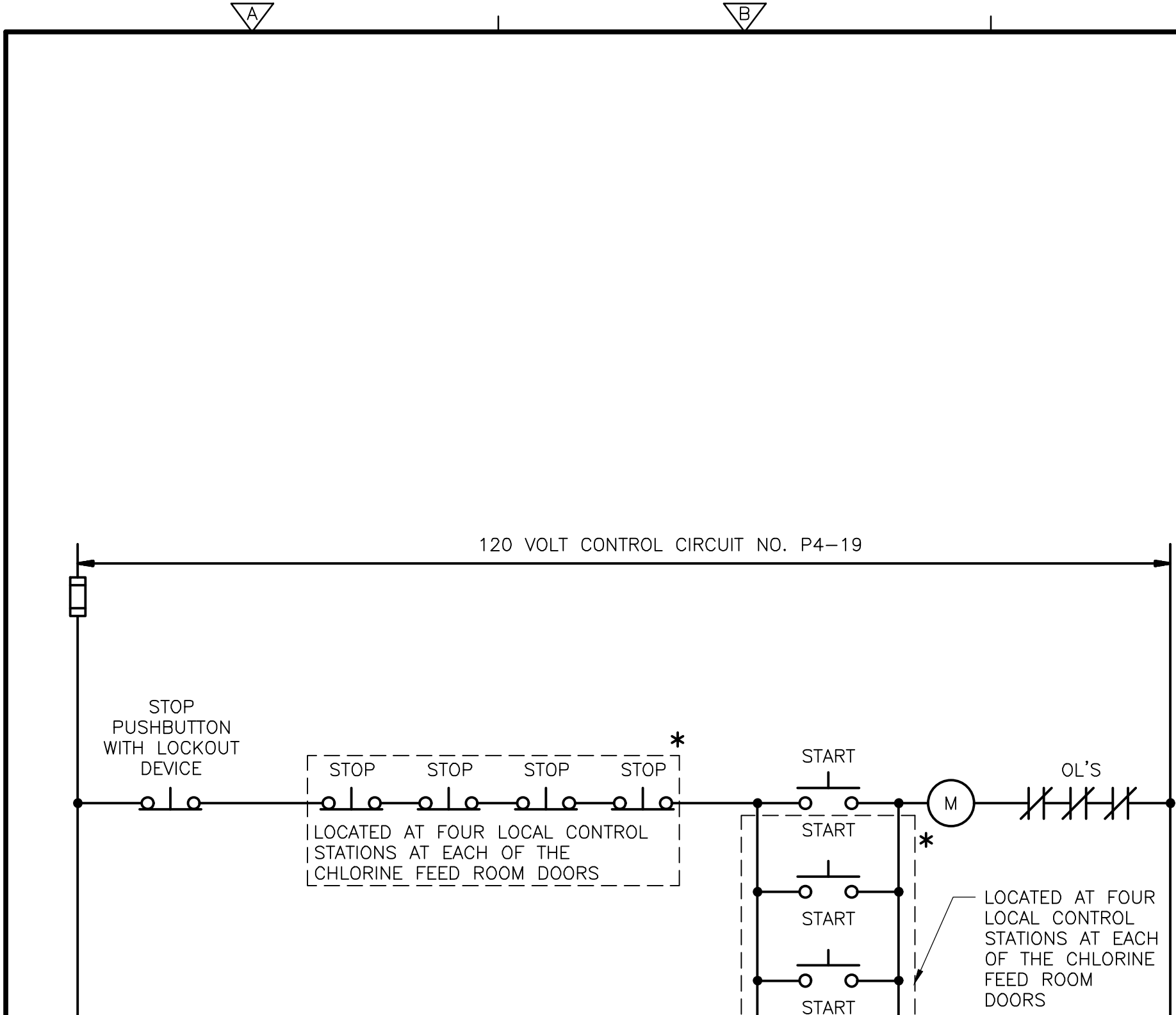
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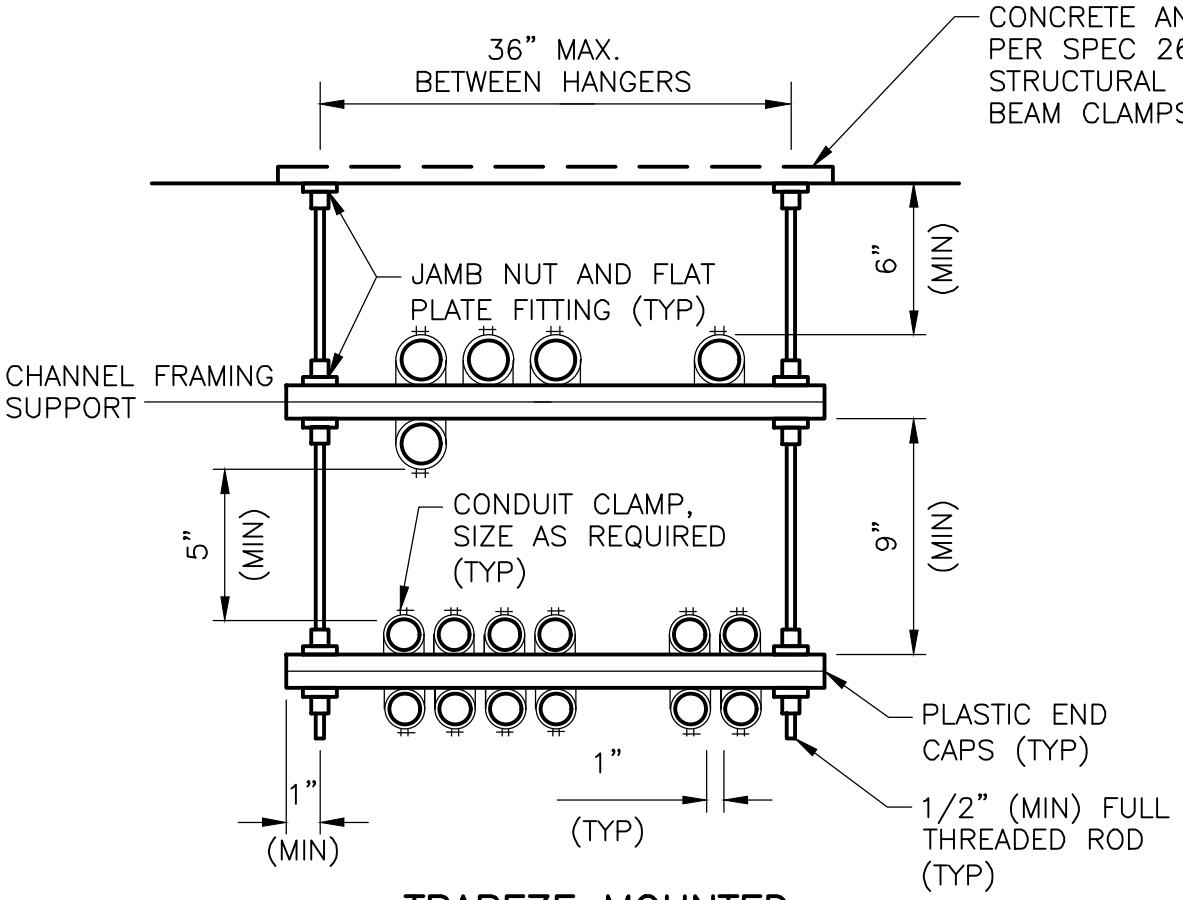
MOTOR CONTROL CENTER–MCC

ONE-LINE DIAG

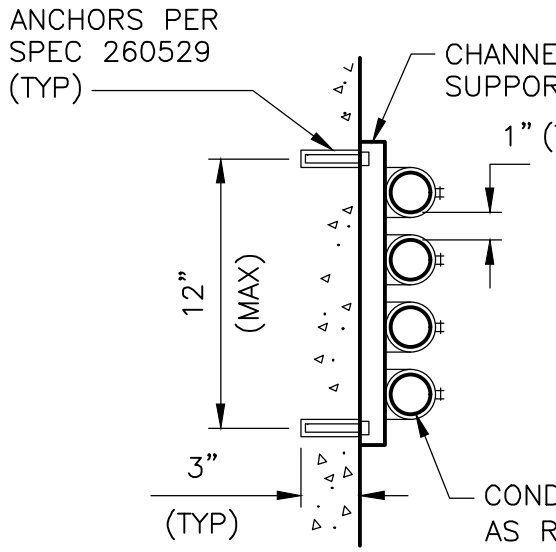
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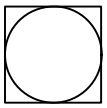
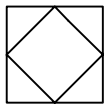
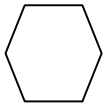
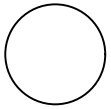
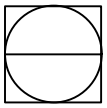
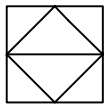
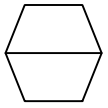
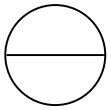
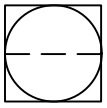
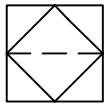
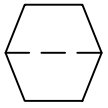
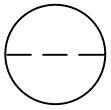
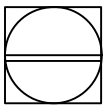
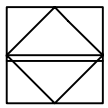
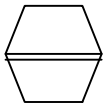
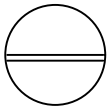
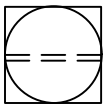
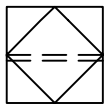
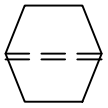
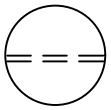
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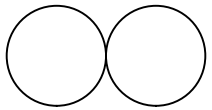
CEILING OR W

NOTE:

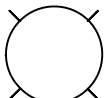
1. SEE SPECIFICATIONS FOR SUPPORT MATERIAL REQUIREMENTS.

GENERAL INSTRUMENT OR FUNCTION SYMBOLS

SHARED DISPLAY/ SHARED CONTROL				
PRIMARY CHOICE	SECONDARY CHOICE	COMPUTER SOFTWARE	DISCRETE	LOCATION AND ACCESSIBILITY
				FIELD MOUNTED AND NORMALLY OPERATOR ACCESSIBLE
				PRIMARY CONTROL PANEL MOUNTED AND NORMALLY OPERATOR ACCESSIBLE
				PRIMARY CONTROL PANEL MOUNTED AND NOT NORMALLY OPERATOR ACCESSIBLE
				SECONDARY CONTROL PANEL MOUNTED AND NORMALLY OPERATOR ACCESSIBLE
				SECONDARY CONTROL PANEL MOUNTED AND NOT NORMALLY OPERATOR ACCESSIBLE



INSTRUMENTS SHARING COMMON HOUSING



PILOT LIGHT

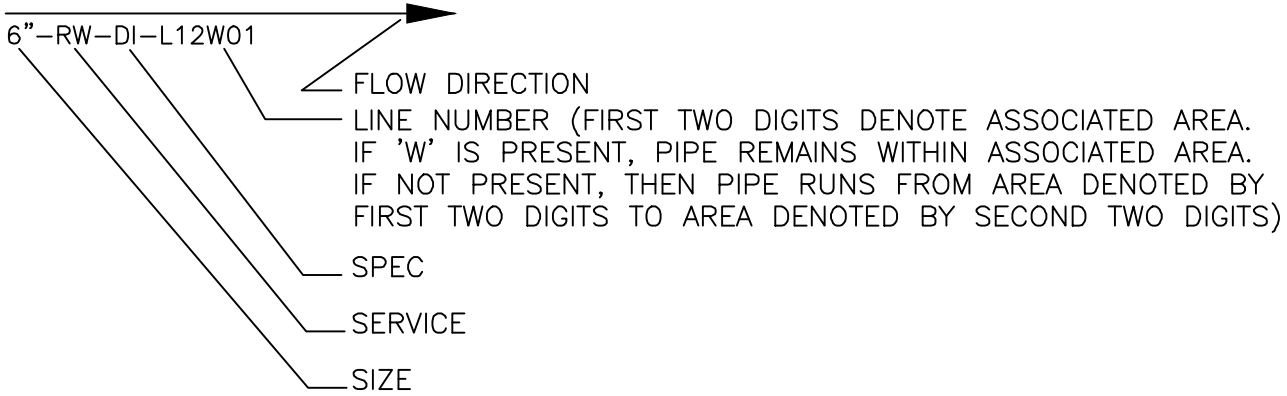
	FI
	COLUMN 1
	MEASURED/INITIAT VARIABLE
A	ANALYSIS
B	BURNER, COMBUST
C	USER'S CHOICE
D	USER'S CHOICE
E	VOLTAGE
F	FLOW, FLOW RATE
G	USER'S CHOICE
H	HAND
I	CURRENT
J	POWER
K	TIME, SCHEDULE
L	LEVEL
M	MOISTURE
N	USER'S CHOICE
O	USER'S CHOICE
P	PRESSURE
Q	QUANTITY
R	RADIATION
S	SPEED, FREQUENC
T	TEMPERATURE
U	MULTIVARIABLE
V	VIBRATION, MECHANICAL, ANAL
W	WEIGHT, FORCE
X	UNCLASSIFIED (1)
Y	EVENT, STATE, PRESENCE
Z	POSITION, DIMENSI

D, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CDM SMITH.

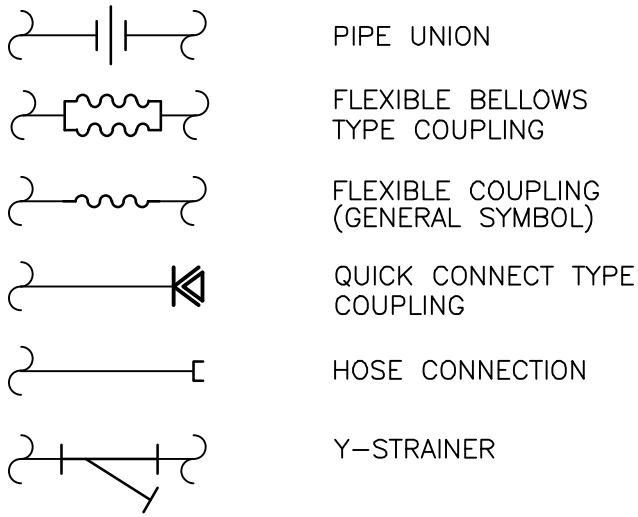
D, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CDM SMITH.

A B

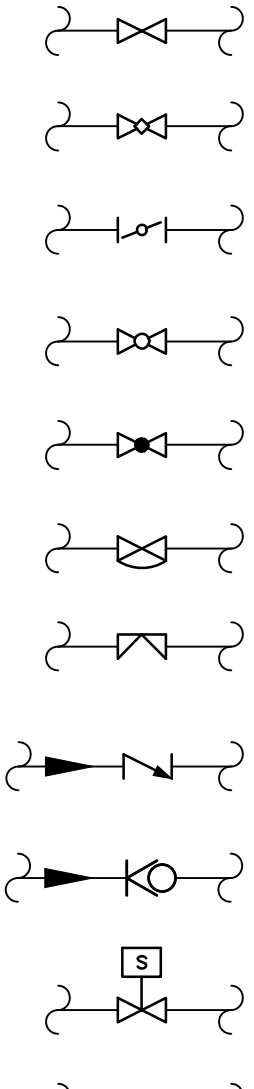
TYPICAL PIPE TAG NUMBERS & DESIGNATION



PIPE LINE SYMBOLS



VALVE



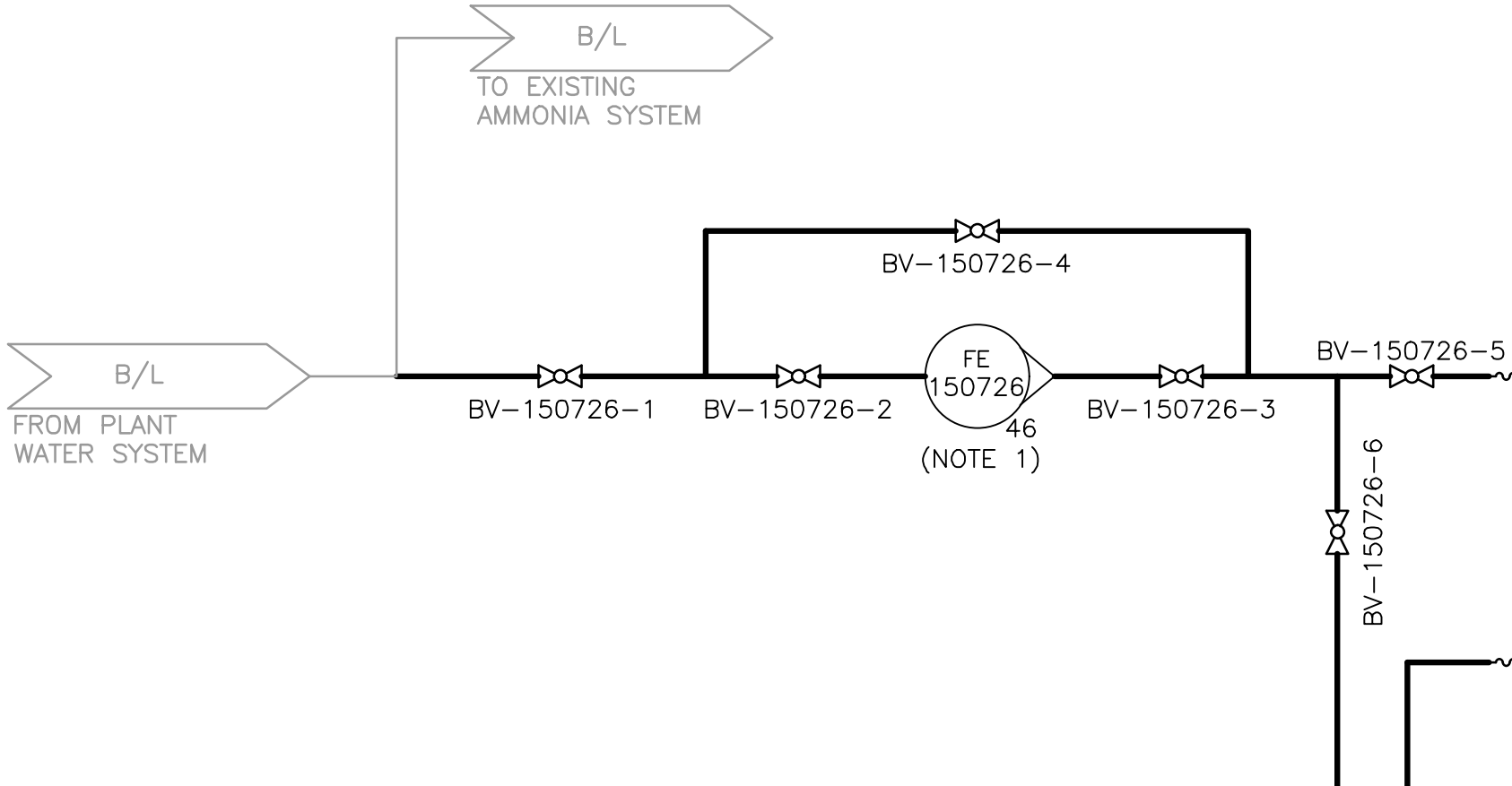
D, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CDM SMITH.

D, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CDM SMITH.

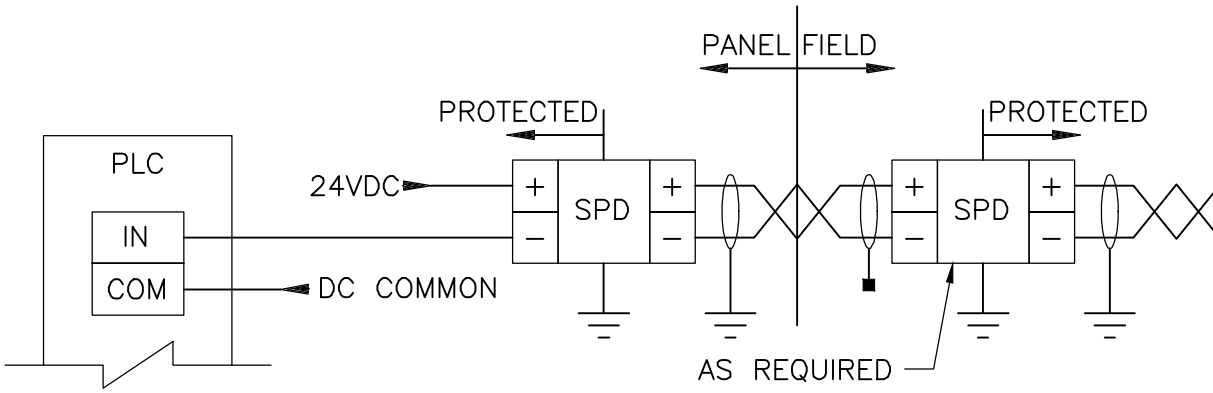
A

B

PLC–CHEM



D, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CDM SMITH.



TYPICAL TRANSMITTER LOOP (LOOP POWERED: 2 WIRE)

DETAIL A

NTS

NOTES:

1. TERMINATE SPD
   DAISY CHAIN.
2. TERMINATE SHIE
   BUS/ GROUND.
3. TAPE BACK SHIE
4. WHERE SPD ARE
   SURGE PROTECT
   POSSIBLE.
5. INSTALL SPD IN
   ENVIRONMENT. S

5. PRICING PROPOSAL

WTP CHEMICAL SYSTEM IMPROVEMENTS

Bidder must submit a bid for all of the bid line items or the bid submission will be considered to be non-responsive and not considered for award of the project. The city retains the right to choose all, none or some of the bid line items as is in the best interest of the City. Bidder agrees to hold all pricing for ninety (90) days form the bid due date not including the day of the bid opening.

Line Item	Description	Quantity	Unit of Measure	Unit Cost	Total
1a	Chlorine Scrubber System - All work shown in the contract documents for installation of the chlorine scrubber system including structural, HVAC, electrical, installation, labor, materials, equipment, and all other work necessary to complete the installation of a fully functioning chlorine scrubber system.	1	LS		
1b	Contingency (10% of Item No. 1a) - Reference Section 012100 and General Conditions Article 11.05	1	LS		
2a	Anhydrous Ammonia System - All work shown in the contract documents for installation of the anhydrous ammonia system including structural, HVAC, electrical, instrumentation, labor, materials, equipment and all other work necessary to complete the installation of a fully functioning anhydrous ammonia system.	1	LS		
2b	Contingency (10% of Item No. 2a) - Reference Section 012100 and General Conditions Article 11.05.	1	LS		
TOTAL					

6. INSURANCE REQUIREMENTS

6.1. Insurance - Public Works Projects

Prior to the commencement of work governed by any contract between the CITY and any Third Party, the Third Party shall provide the CITY satisfactory evidence of insurance coverage via a valid Certificate of Insurance showing coverage provided by a carrier who has no less than an A- VIII rating with AM Best's Rating. The Certificate must list the CITY, its employees, and officials as additional named insured's. The Certificate must also list coverage as primary and non-contributory, include a waiver of subrogation, and include a thirty (30) days cancellation notice.

All coverage, as follows shall be maintained through the life of the contract and include, as a minimum:

A. General Liability – $2,000,000 per occurrence/$4,000,000 aggregate Bodily Injury and Property Damage

B. Products & Completed – $2,000,000

C. Worker's Compensation – $1,000,000 Each Accident/$1,000,000 Disease-Each Employee/$1,000,000 Disease-Policy Limit

D. Automobile Liability – $2,000,000 with $5,000 medical payments

E. Umbrella/Excess Liability – $5,000,000

F. Errors & Omissions – $2,000,000

    1. Required for contracts with Consultants for Professional Services

G. Crime & Theft Coverage – $2,000,000

    1. Required when Third Party will have access to City property

Insurance: Vendors providing a service or installing equipment on or about City property shall provide to the City Clerk evidence of Comprehensive, Liability, and Workman's Compensation insurance prior to commencement of work on City property. The vendor guarantees to save the City, its agents or employees, harmless from liability of any nature or kind, for use of any copyright, composition, secret process, pa-tented or unpatented invention, articles or appliances furnished or used in the performance of the contract, or which the vendor is not the patentee, assignee, or licensee.

Furthermore, the vendor hereby agrees to save and hold harmless and indemnify the City from and against all injury, death, damage, loss, claims and liability caused by or arising out of the performance of this agreement by the Vendor, its employees, agents or sub-vendors. This agreement extends to all claims, of any nature, whether made by the Vendor's employees or third parties.

7. TERMS AND CONDITIONS

7.1. No Bid

Bidders/Consultants who are not able to submit a bid for this service, but wish to receive bid tabulation should "Follow" the project to receive automated notifications pertaining to this solicitation.

7.2. Ex Parte Communication

Please note that to insure the proper and fair evaluation of a proposal or bid, the City of Bloomington prohibits ex parte communication (i.e., unsolicited) initiated by the Bidder to a City Official (i.e. City Aldermen, Mayor, etc.) or Employee evaluating or considering the proposal/bid prior to the time a selection has been made. Communication includes but is not limited to fax, phone calls, email and personal visit. Communication between Bidder and the City shall be directed in writing to the Procurement Manager or designated contact person only. The Procurement Manager will obtain the information or clarification needed. Ex parte communication may be grounds for disqualifying the offending Bidder from consideration or award of the proposal/bid and repeat offenders may be disqualified from future projects.

7.3. Delivery

F.O.B. Bloomington, IL FREIGHT PREPAID.
Delivery will be considered in making the award and the Bidders/Consultants shall state, in the spaces provided, expected delivery after receipt of Purchase Order. Failure to meet said delivery promises without prior consent of the City Procurement Manager may be considered a breach of faith.

7.4. Full Pricing and Contingencies

Please quote your best net price including delivery and discounts to meet the approval of the City. Prices shall be stated in units of quantity specified. No additional charges shall be passed to the City, including any applicable taxes, delivery or surcharges. Prices quoted shall be the final cost to the City. The City shall hold the successful Bidder/Consultant to the bid pricing. Additional charges for contingencies discovered by the Bidder/Consultant at any time after the date of the opening of this bid may not be considered for payment by the City.

7.5. Payment Terms

If payment terms are not indicated, terms of NET 45 days shall be applied by the City. Payment terms to apply after receipt of invoice or final acceptance of the products/services, whichever is later. Payment terms offering less than 20 days for payment will not be considered.

7.6. Bid Evaluation

Bids will be evaluated and awarded to the lowest responsible, responsive Bidder for the bid line items selected by the City. The quality of the services, conformity with the specifications, suitability to the requirements, delivery terms including length of time for delivery, qualifications and references will be taken into consideration in making an award. The City will be the sole judge of acceptability of any products offered.

7.7. Recourse for Unsatisfactory Materials

Payment shall be contingent upon the City's inspection of and satisfaction with completed work. Any defective work or materials, non-conformance to bid specifications, damaged materials, or unsatisfactory installation shall be corrected to the City's satisfaction by the successful bidder/consultant at no additional charge.

7.8. Proof of License, Permit, Etc.

Consultants must provide proof of conformance with any applicable Federal/State/Local permits, licenses, certifications, etc., as stated in the scope of work/specifications section. It is the Consultant's responsibility to inquire about requirements of performing the job with the requesting department contact person.

7.9. Investigation

Bidders must acquaint themselves with the policies of the City, and may do so by contacting the Procurement Manager. All questions as to the meaning of the scope of work must be resolved prior to the bid submission deadline.

Bidder shall examine the plans and specifications for the work, and also the ground, and judge for themselves all circumstances affecting the cost and nature of the work, and must also examine the maps, plans, profiles and specifications as provided for in this solicitation.

Bidder is required to inform themselves fully of the conditions relating to construction and labor under which the work will be or is now being performed. The Contractor must employ, insofar as possible, such methods and means in carrying out the work as will not cause any interruption or any interference with any other contractor.

Any interpretation of the specifications will be made only by addendum duly issued and a copy of such addendum will be e-mailed to each person on record as following this project. The City will not be responsible for any explanation or interpretation other than the addendum.

It is the Bidder's responsibility to check the City's e-Procurement Portal prior to submitting their bid to ensure that they have received all Addenda issued.

7.10. Bid Form

The entire package shall be electronically returned complete and intact with all information requested and all questions answered. Failure to do so may be considered grounds for rejection of the bid. The amount of the bid shall be stated in the pricing table within ProcureNow.

7.11. Specifications

The Specification may, in some areas, be unique to a particular brand of product or type of service. If this situation exists, equal consideration will be given to all Bidders/Consultants whose items, in the opinion of the City, meets or exceeds performance in these areas.

7.12. Equals or Substitutes

Or Equal

Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer / Project Manager authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

If Engineer / Project Manager in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer / Project Manager shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

In the exercise of reasonable judgment Engineer / Project Manager determines that:

1. It is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2. It will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3. It has a proven record of performance and availability of responsive service; and

4. It is not objectionable to Owner.

Contractor certifies that, if approved and incorporated into the Work:

1. There will be no increase in cost to the Owner or increase in Contract Times;

2. It will conform substantially to the detailed requirements of the item named in the Contract Documents.

Contractor's Expense: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

Engineer / Project Manager's Evaluation and Determination: Engineer / Project Manager will be allowed a reasonable time to evaluate each "or-equal" request. Engineer / Project Manager may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer / Project Manager will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer / Project Manager's review is complete and Engineer / Project Manager determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer / Project Manager will advise Contractor in writing of any negative determination.

Substitutes

Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is

permitted, Contractor may request that Engineer / Project Manager authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.

Contractor shall submit sufficient information as provided below to allow Engineer / Project Manager to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer / Project Manager will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.

The requirements for review by Engineer / Project Manager will be as set forth below, as supplemented by the Specifications, and as Engineer / Project Manager may decide is appropriate under the circumstances.

Contractor shall make written application to Engineer / Project Manager for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

a. shall certify that the proposed substitute item will:

1. perform adequately the functions and achieve the results called for by the general design,

2. be similar in substance to that specified, and

3. be suited to the same use as that specified.

b. will state:

1. the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,

2. whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

3. whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:

1. all variations of the proposed substitute item from that specified, and

2. available engineering, sales, maintenance, repair, and replacement services.

d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

Engineer / Project Manager's Evaluation and Determination: Engineer / Project Manager will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer / Project Manager may require Contractor to furnish additional data about the proposed substitute item. Engineer / Project Manager will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer / Project Manager's review is

complete and Engineer / Project Manager determines that the proposed item is an acceptable substitute. Engineer / Project Manager's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer / Project Manager will advise Contractor in writing of any negative determination.

Special Guarantee: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

Contractor's Expense: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

7.13. Brand Name, Model, Scope of Work

All Bidders/Consultants shall include with their bid brand names, models, catalog numbers, and complete information about the items they are offering. Safety Data Sheets, SDS, are required for all chemical Bids. Failure to do so may be considered grounds for rejection of the bid.

7.14. Default By Bidders/Consultants/Contractor

In the event of default by Bidder/Consultants/Contractor, the City reserves the right to procure the services from other sources, and hold the Bidders/Consultants liable for any excess costs occasioned thereby. Additionally, a contract shall not be assignable by the Bidders/Consultants in whole or in part without the written consent of the City of Bloomington.

7.15. Performance Bond & Payment Bonds

The contract shall be deemed to have been awarded when the NOTICE OF AWARD shall have been given to the bidder by some officer or agent of the City. The successful bidder will be required to provide Performance and Payment Bonds in the amount equal to 100% of the contract price within ten (10) business days after the bid award. The Performance Bond and Payment Bond shall be duly authorized by a company licensed to do business in the State of Illinois.

If the bidder to whom the award is made shall fail to enter into a contract for the performance of the work, or furnish a performance bond, or provide certificates of insurance as described below within ten (10) days after notice of such award, the bidder shall forfeit all claims to the work, and the amount repre-sented by the bid deposit or bid bond accompanying the bid shall become the property of the City as the agreed and liquidated amount of damages caused by such failure.

7.16. Bid Bond

Bids in excess of $10,000 must be accompanied by a Bid guaranty which shall not be less than ten percent (10%) of the amount of the Bid. At the option of the Bidder, the guaranty may be a cashier's check, mon-ey order, certified bank check or a surety bond. All guaranties, except surety bonds, will be deposited and reimbursement checks and surety bonds will be issued to unsuccessful bidders following the bid award. The Bid bond shall be secured by a guaranty or a surety company listed in the latest issue of U.S. Treasury Circular 570. The amount of such Bid bond shall be within the maximum amount specified for such Company in said Circular 570. No Bid will be considered complete unless it is accompanied by the required guaranty of a cashier's check, money order, certified bank check made

payable to the City of Bloomington; or a surety bond. The Bid guaranty shall insure the execution of the Agreement and the fur-nishings of the surety bond or bonds by the successful Bidder, all as required by the Contract Documents.

Revised Bids submitted before the opening of Bids, whether forwarded by mail or telegram, if represent-ing an increase in excess of two percent (2%) of the original Bid, must have the Bid guaranty adjusted ac-cordingly; otherwise the Bid will not be considered.

7.17. Cancellation

Failure to comply with the terms and conditions as herein stated shall be cause for cancellation of the contract. The City will provide a written notice of unsatisfactory performance and the Bidder/Consultant or Bidders/Consultants will be allowed adequate time, typically thirty (30) days, to take corrective action and accomplish satisfactory control. If at the end of the stated time to correct, the City may deems that the Bidder/Consultant or Bidders'/Consultants' performance is still unsatisfactory, the contract may be canceled. The exercise of its right of cancellation shall not limit the City's right to seek any other remedies allowed by law.

7.18. Rejection of Bids, Waivers or Irregularity

The City reserves the right to reject any or all bids, to waive irregularities, and to accept that bid which is considered to be in the best interest of the City. Any such decision shall be final.

7.19. Protests

Any actual or prospective Bidder/Offeror/Consultant who is aggrieved in connection with this proposal or award may protest to the City Manager within ten (10) days of the award. The protest must be submitted in writing to the Office of the City Clerk immediately after such aggrieved person knows or should have known of the facts.

7.20. Prevailing Wage

The State of Illinois requires under public works contracts that the general prevailing rate of wages in this locality be paid for each craft or type of worker hereunder. This requirement is in accordance with the Prevailing Wage Act (820 ILCS 130) as amended. This shall include payment of the general prevailing rate for legal holiday and overtime work. It shall be mandatory upon the subcontractor under the Contrac-tor. A copy of the most current monthly prevailing wage rates by County is posted on the Illinois Depart-ment of Labor website at https://www2.illinois.gov/idol/Laws-Rules/CONMED/Pages/prevailing-wage-rates.aspx. This also acknowledges Public Act 100-1177 effective June 1, 2019. Prevailing Wage rates change monthly, and it is the contractor's responsibility to ensure the correct wage is paid.

As a prerequisite of awarding construction contracts in excess of $100,000.00, contractor(s) will provide proof of participation in apprenticeship and training programs approved and registered with the United States Department of Labor's Bureau of Apprenticeship and Training.

7.21. Certified Payroll Requirements (820 ILCS 130/5 & 820 ILCS 130/5.1)

Contractors and subcontractors on public works projects must submit certified payroll records on a monthly basis to the Illinois Department of Labor Certified Transcript of Payroll Portal, that the wages

paid to each worker are not less than the required prevailing rate for that County and that the contractor is aware that filing records he or she knows to be false is a Class B misdemeanor. The certified payroll records must include for every worker employed on the public works project, the name, address, telephone number, social security number, job classification, hourly wages paid in each period, number of hours worked each day, and starting and ending time of each work day. These certified payroll records are considered public records and public bodies must make these records available to the public under the Freedom of In-formation Act, with the exception of the employee's address, telephone number and social security number. Any contractor who fails to submit a certified payroll or knowingly files a false certified payroll is guilty of a Class B misdemeanor.

7.22. OSHA Requirements

The Occupational Safety and Health Act of 1970 (OSHA), "guarantees workers the right to a safe and healthful workplace." Under Section 5(a) (1) of the OSHA Act, the employer must "furnish to each of his employees' employment and place of employment which are free from recognized hazards that are causing or likely to cause death or serious physical harm to its employees."

There are times when the City must hire entities and individuals (contractors) to perform services. To this end, contractors hired by the City must perform their duties in a manner that is compliant with all State and Federal health and safety laws and industry guidelines. It is the responsibility of the contractor to en-sure that their personnel and subcontractors comply with all State and Federal health and safety laws, reg-ulations and industry guidelines, including, but not limited to those set forth by: OSHA and related regu-lations, the Safety Inspection and Education Act, the Health and Safety Act, the National Institute of Occupational Safety and Health, the National Fire Protection Association, the Centers for Disease Con-trol, American Industrial Hygiene Association, the American Council of Governmental Industrial Hygien-ists, the Environmental Protection Agency, and the Department of Transportation.

7.23. Substance abuse Prevention on Public Works Projects Act

The successful bidder must be in compliance with the State of Illinois HB-1855 (Public Act 095-0635), which amends the Prevailing Wage Act. Before an employer commences work on a public works project, the employer shall have in place a written program, which meets or exceeds the program requirements in this Act, to be filed with the public body engaged in the construction of the public works and made avail-able to the general public, for the prevention of substance abuse among its employees. The testing must be performed in a laboratory that is certified for Federal Workplace Drug Testing Programs by the Substance Abuse and Mental Health Service Administration of the U.S. Department of Health and Human Services.

7.24. Local preference Policy

The City of Bloomington has adopted a Local Preference Purchasing Policy that is applicable in the City's competitive bidding processes, except in situations where external funding sources do not permit local preference purchasing allowances, in situations where the goods or services being purchased are available through a cooperative purchasing program, or where waived by the City. Bidders/Consultants should complete the Local Preference Purchasing Policy Certificate if Bidder/Consultant qualifies as a local Bidder/Consultant under the Policy. The Policy is in place to address, in part, responsiveness and related concerns of the City.

7.25. Security

The Bidder/Consultant represents and warrants to the City that neither it nor any of its principals, shareholders, members, partners or affiliates, as applicable, is a person or an entity named as a Specially Designated National and Blocked Person (as defined in Presidential Executive Order 13224) and that it is not acting, directly or indirectly, for or on behalf of a Specially Designated or Blocked Person. The Bidder/Consultant further represents and warrants to the City that the Bidder/Consultant and its principals, shareholders, members, partners, or affiliates as applicable, are not directly or indirectly, engaged in, and are not facilitating, the transactions contemplated by this Agreement on behalf of any person or entity named as Specially Designated National and Blocked Person. The Bidder/Consultant hereby agrees to defend, indemnify and hold harmless the City of Bloomington, and all City elected or appointed officials, officers, employees, agents, representatives, engineers and attorneys, from and against any and all claims, damages, losses, risks, liabilities, and expenses (including reasonable attorneys' fees and costs) arising from or related to any breach of the foregoing representation and warranties.

7.26. Indemnification

Bidder/Consultant shall indemnify, defend with counsel approved by City, and hold harmless City, its officers, officials, employees and volunteers from and against all liability, loss, damage, expense, cost (including without limitation reasonable attorney's fees, expert fees and all other costs and fees of litigation) of every nature arising out of or in connection with Consultant's performance of work hereunder or its failure to comply with any of its obligations contained in this Agreement, regardless of City's passive negligence, but excepting such loss or damage which is caused by the sole active negligence or willful misconduct of the City. Should City in its sole discretion find Bidder's/Consultant's legal counsel unacceptable, then Bidder/Consultant shall reimburse the City its costs of defense, including without limitation reasonable attorney's fees, expert fees and all other costs and fees of litigation. The Bidder/Consultant shall promptly pay any final judgment rendered against the City (and its officers, officials, employees and volunteers) covered by this indemnity obligation. It is expressly understood and agreed that the foregoing provisions are intended to be as broad and inclusive as is permitted by the law of the State of Illinois and will survive termination of this Agreement.

8. VENDOR QUESTIONNAIRE

8.1. Authorized Person(s)*

By submitting a response to this solicitation, the bidder certifies that this Quote is made without prior understanding, agreement, or connection with any corporation, firm, or person submitting a quote for the same services, materials, supplies, or equipment, and is in all respect fair and without collusion and fraud. The bidder agrees to abide by all conditions of this quote and certifies that they are authorized to submit this quote.

*Response required

8.2. Bid Bond *

Each bid shall be accompanied by a certified cashier's check, or bid bond, in the amount of ten percent (10%) of the total bid price, payable to City of Bloomington, Illinois, as a guarantee that the bidder, if its bid is accepted, will promptly execute the Agreement. The bidder shall guarantee the total bid price for a period of 60 days from the date of the bid opening.

Please upload a copy of your bid bond/cashier's check. Bidder must also submit an original copy of the bid guarantee to be received no later than the bid due time on Thursday, September 1, 2022 addressed to:

City of Bloomington - The HUB
Carla Murillo - Procurement
115 E. Washington St., Suite 103
Bloomington, IL 61701

Please have the Bidder Name, Contract Title ("WTP Chemical Systems Improvements"), and Contract Number ("Bid 2023-06") listed clearly on the outside of the envelope.

*Response required

8.3. Contractors Certification of Compliance with Gift Ban Act*

The undersigned firm certifies its officers, employees and agents, have not made any gifts to officers or employees of the City of Bloomington in violation of Illinois Compiled Statutes, 5 ILCS 430/Article 10, State Officers and Employees Ethics Act (commonly known as the "Gift Ban Act").

The Act is available online at:
http://www.ilga.gov/legislation/ilcs/ilcs4.asp?DocName=000504300HArt%2E+10&ActID=2529&ChapterID=2&SeqStart=1700000&SeqEnd=2200000.

I further certify that as a bidder, I have not violated the Bloomington City Code Chapter 2, Administration; Article I, Section 8: Officers and Employees Generally: Section 8a Prohibition on the Solicitation and Acceptance of Gifts; and 8b State Officials and Employees Ethics Act. This section of the Bloomington City Code is available online at http://www.cityblm.org/code.asp?show=section&id=3450.

☐ Please confirm

*Response required

8.4. Substance Abuse Prevention Program - Public Act 95-0635*

Before the Contractor and any Subcontractor commences work, the Contractor and any Subcontractor shall have in place a written Substance Abuse Prevention Program for the prevention of substance abuse among its employees which meets or exceeds the requirements in Public Act 95-0635 or shall have a collective bargaining agreement in effect dealing with the subject matter of Public Act 95-0635.

The Contractor and any Subcontractor shall file with the CITY: a copy of the substance abuse prevention program along with a cover letter certifying that their program meets the requirements of the Act, or a letter certifying that the Contractor or a Subcontractor has a collective bargaining agreement in effect dealing with the subject matter of this Act.

☐ Please confirm

*Response required

8.5. Contractors Certification of Compliance with Public Act 85-1295*

The vendor certifies by signing this statement that this bid is made without prior understanding, agreement or accord with any other person submitting a bid for the same product or service and that this bid is in all respects bona fide, fair and not the result of any act of fraud or collusion with another person engaged in the same line of business or commerce. Furthermore, the firm certifies that it is not barred from bidding on this contract as a result of a conviction for the violation of State laws prohibiting bid-rigging or bid-rotating. Any false statement hereunder constitutes a felony and can result in a fine and imprisonment as well as civil damages. The vendor also understands that failure to sign this statement will make the bid non-responsive and unqualified for award.

☐ Please confirm

*Response required

8.6. Contractors Certification of Compliance with 2CFR180*

The undersigned firm certifies that it is not barred or suspended by the federal government under the provisions of 2CFR180.

☐ Please confirm

*Response required

8.7. Insurance*

Vendors providing a service or installing equipment on or about City property shall provide to the City Clerk evidence of Comprehensive, Liability, and Workman's Compensation insurance prior to commencement of work on City property. The vendor guarantees to save the City, its agents or employees, harmless from liability of any nature or kind, for use of any copyright, composition, secret process, patented or unpatented invention, articles or appliances furnished or used in the performance of the contract, or which the vendor is not the patentee, assignee, or licensee.

Furthermore, the vendor hereby agrees to save and hold harmless and indemnify the City from and against all injury, death, damage, loss, claims and liability caused by or arising out of the performance of this agreement by the Vendor, its employees, agents or sub-vendors. This agreement extends to all claims, of any nature, whether made by the Vendor's employees or third parties.

☐ Please confirm

*Response required

8.8. Certificate of Insurance*

Please upload a copy of your Certificate of Insurance.

*Response required

8.9. Non-Discrimination*

The City of Bloomington requires all Vendors doing business with the City not to discriminate against anyone on the basis of race, age, color, religion, gender, ancestry, national origin, marital status, mental or physical disability unrelated to ability, familial status or sexual orientation.

Vendors shall comply with the Illinois Human Rights Act, 775 ILCS 5/101 et seq., as amended and any rules and regulations promulgated in accordance therewith, including, but not limited to the Equal Employment Opportunity Clause, Illinois Administrative Code, Title 44, Part 750 (Appendix A), 775 ILCS 5/1-102 and constituting of a written EEO policy and a workforce profile that demonstrates its EEO practices. Furthermore, the Vendor or Vendors shall comply with the Public Works Employment Discrimination Act, 775 ILCS 10/0.01 et seq., as amended. The Vendor or Vendors must have a written sexual harassment policy, which meets Illinois Compiled State Statutes, 775 ILCS, 15/3.

☐ Please confirm

*Response required

8.10. Equal Opportunity Guidelines*

The City requires all Vendors doing business with the City not to discriminate against anyone on the basis of race, age, color, religion, gender, sexual orientation, ancestry, national origin, and non-job-related disabilities. This program was approved by the City Council on May 27, 1974. In accordance with this program, the City shall require that the Vendor or Vendors be familiar and comply in every respect with the provisions of this program. Information regarding the program may be obtained by contacting the Human Relations Department 309-434-2218.

☐ Please confirm

*Response required

8.11. Local Preference Purchasing Policy Consideration*

The City of Bloomington has adopted a local preference purchasing policy. Under the terms of the policy local Consultants may be granted a pre-determined preference in competitive bidding situations. Bids from qualified local Consultants may receive the following adjustment to the submitted bid:

A. 5% up to a maximum of $2,500 on bids of $10,000 up to $50,000;

B. 4% up to a maximum of $10,000 on bids of up to $250,000;

C. 3% up to a maximum of $30,000 on bids of up to $1,000,000; and

D. $50,000 on bids of over $1,000,000.

For purposes of comparison and consideration in awarding contracts the preferential discount will be applied to the low bid of all qualified local Consultants when determining the lowest responsible bid. The City Council reserves the right to waive or amend the local preference purchasing policy in connection with any bid, when it deems it in the best interest of the citizens of Bloomington.

A Local Consultant is defined as any business that meets all of the following criteria:

A. The business has established and maintained a physical presence within the County of McLean, via the ownership or lease of a building or a portion of a building for a period of not less than 12 consecutive months; and

B. The business employs a minimum of two full time employees at the McLean County location and those employees spend the majority of their work day and work week at the McLean County location; and

C. The business is legally authorized to conduct business within the State of Illinois and the County of McLean.

Select all that apply

☐ The undersigned hereby certifies to the City of Bloomington that it is a Local Consultant as defined above and qualifies for the Local Consultant Preference pursuant to the City of Bloomington Local Preference Purchasing Policy.

☐ The undersigned acknowledges the firm does not qualify for the Local Preference consideration.

*Response required

8.12. General Save and Hold Harmless*

Vendor hereby agrees to save, hold harmless, and indemnify the City from and against all injury, death, damage, loss, claims, and liability caused by or arising out of the performance of this agreement by the Vendor, its employees, agents, or sub-vendors. This agreement extends to all claims, of any nature, whether made by the Vendor's or third parties.

☐ Please confirm

*Response required

8.13. References*

Please provide a minimum of three (3) references to include the following for each reference:

Company Name
Contact Person
Address
Telephone Number
Email
Scope of work performed

*Response required

8.14. Bid Form*

Bid Bid 2023-06
WTP Chemical Systems Improvements

By submitting a response to this solicitation, we, the authorized person(s) for this organization, agree to the terms and conditions used by the City of Bloomington, Illinois, at the bid price submitted, and to supply all services and/or commodities as required in the requirements and Instructions to Bidders. We further agree to deliver the commodity and/or services as outlined with in this document, FOB Bloomington, Illinois, freight prepaid.

The bidder certifies that it has not been barred from contracting with a unit of State or Local government in the State of Illinois as a result of a violation of Section 33E-3 or 33E-4 of the Criminal Code of 1961, as amended.

We further agree to complete all of the work, as required in this solicitation, in a complete, neat, and workmanlike manner.

☐ Please confirm

*Response required

8.15. Apprenticeship Training*

If bid is in excess of $100,000.00, contractor(s) will provide, with their bid submission, proof of participation in apprenticeship and training programs approved and registered with the United States Department of Labor's Bureau of Apprenticeship and Training.

☐ Please confirm

*Response required

8.16. Apprenticeship Training Documentation*

Please provide your Apprenticeship Training Documentation.

*Response required

8.17. Prevailing Wage*

By submitting a response to this solicitation the vendor has read, understands and agrees to the requirements of Prevailing Wage as provided for in this solicitation.

☐ Please confirm

*Response required

8.18. Minority Owned, Women Owned, Veteran Owned, Small Business Certifications*

Please select the categories that pertain to your organization. Select all that apply.

Select all that apply

☐ Minority Owned Business

☐ Women Owned Business

☐ Veteran Owned Business

☐ Small Business Enterprise

☐ None of the Above Apply

*Response required

8.19. Subcontractor - Category Information*

By submitting a response to this solicitation, the authorized person(s) agrees to provide category information for the subcontractors utilized if they are the selected vendor on this project.

☐ Please confirm

*Response required

8.20. Contractor agrees that the PCSS must be SCADAware (2023 Eagle Road, Normal IL 61761)*

Please confirm compliance with this requirement.

☐ Please confirm

*Response required

8.21. Other Documentation

Please upload any additional required certificates, permits, etc. pertaining to this solicitation as a single PDF file.

8.22. Equal Opportunity Plan

*8.22.1. Equal Employment Opportunity**

In the event of the bidder's non-compliance with the provisions of this Equal Opportunity Clause, the Illinois Human Rights Act or the Rules and Regulations of the Illinois Department of Human Rights ("Department"), or the City of Bloomington's Contract Compliance Program, the bidder may be declared

ineligible for future contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations, including the City of Bloomington, and the contract may be canceled or voided in whole or in part, and such other sanctions or penalties may be imposed or remedies invoked as provided by statute, ordinance or regulation. During the performance of this contract, the bidder agrees as follows:

A. That it will not discriminate against any employee or applicant for employment because of race, color, religion, gender, sexual orientation, marital status, national origin or ancestry, age, physical or mental disability unrelated to ability, or an unfavorable discharge from military service; and further that it will examine all job classifications to determine if minority persons or women are underutilized and will take appropriate affirmative action to rectify any such under-utilization.

B. That, if it hires additional employees in order to perform this bidder any portion thereof, it will determine the availability (in accordance with the Department's Rules and Regulations or those of the Human Relations Commission) of minorities and women in the area(s) from which it may reasonably recruit and it will hire for each job classification for which employees are hired in such a way that minorities and women are not underutilized.

C. That, in all solicitations or advertisements for employees placed by it or on its behalf, it will state that all applicants will be afforded equal opportunity without discrimination because of race, color, religion, gender, sexual orientation, marital status, national origin or ancestry, age, physical or mental disability unrelated to ability, familial status, or an unfavorable discharge from military service.

D. That it will send to each labor organization or representative of workers with which it has or is bound by a collective bargaining or other agreement or understanding, a notice advising such labor organization or representative of the bidder's obligations under the Illinois Human Rights Act and the Department's Rules and Regulations. If any such labor organization or representative fails or refuses to cooperate with the bidder in its efforts to comply with such Act and Rules and Regulations, the bidder will promptly so notify the Department and Human Relations Commission and the contracting agency and will recruit employees from other sources when necessary to fulfill its obligations thereunder.

E. That it will submit reports as required by the Department's Rules and Regulations and Human Relations Commission, furnish all relevant information as may from time to time be requested by the Department or the contracting agency, and in all respects comply with the Illinois Human Rights Act and the Department's Rules and Regulations and those of the City of Bloomington's Contract Compliance Program.

F. That it will permit access to all relevant books, records, accounts and work sites by personnel of the contracting agency and the Department for purposes of investigation to ascertain compliance with the Illinois Human Rights Act and the Department's Rules and Regulations and those of the City of Bloomington's Contract Compliance Program.

G. That it will include verbatim or by reference the provisions of this clause in every subcontract it awards under which any portion of the contract obligations are undertaken or assumed, so that such provisions will be binding upon such subbidder. In the same manner as with other provisions of this contract, the bidder will be liable for compliance with applicable provisions of this clause by such subbidders; and further it will promptly notify the contracting agency, the Department and the Human Relations Commission in the event any subbidder fails or refuses to comply therewith. In addition, the bidder will not utilize any subbidder declared by the Illinois Human Rights Commission or Human Relation Commission to be ineligible for contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations including the City of Bloomington.

Failure to properly complete questions pertaining to the Equal Opportunity Plan as required as part of the submission with bid or proposal will result in your submission not being considered responsive and result in the denial of eligibility to bid or do business with the City of Bloomington for this project/services/goods. A copy of the Equal Opportunity plan for your firm should be included with this response.

☐ Please confirm

*Response required

*8.22.2. Business Classification**

Please select one of the following:

☐ Corporation

☐ Partnership

☐ Individual Proprietorship

☐ Limited Liability Corporation

*Response required

*8.22.3. Principal Office**

Provide the following information for your Company's principal office:

Name
Address
City, State, Zip
Major Activity of your company (product or service)

*Response required

*8.22.4. EEO Policies and Practices - 1**

Is it the Company's policy to recruit, hire, train, upgrade, and discipline persons without regard to race, sex, color, religion, national origin, age, mental and/or physical disability, and sexual orientation?

☐ Yes

☐ No

*Response required

8.22.5. EEO Policies and Practices - 2*

Has someone been assigned to develop procedures, which will assure that the EO policy is implemented and enforced by managerial, administrative, and supervisory personnel? If so, please indicate the name and title of the charged with this responsibility. If not, please type "N/A".

*Response required

8.22.6. EEO Policies and Practices - 3*

Has the Company developed a written Equal Opportunity Plan? Note: A copy of the Equal Opportunity Plan must be submitted with this form in order to be considered eligible to do business with the /city of Bloomington. If you would need technical assistance in developing your plan, please contact the Community Relations Office at: (309) 434-2215.

*Response required

8.22.7. EEO Policies and Practices - 4*

Has the Company developed a written policy statement prohibiting Sexual Harassment? Please attach a copy of the policy statement.

*Response required

8.22.8. EEO Policies and Practices - 5*

Have all recruitment sources been notified that the Company will consider all qualified applicants without regard to race, color, age, sex, national origin, religion, mental and/or physical disability, or sexual orientation?

☐ Yes

☐ No

*Response required

8.22.9. EEO Policies and Practices - 6*

If advertising is used, does it specify that all qualified applicants will be considered for employment without regard to race, color, age, sex, national origin, religion, mental and/or physical disability, or sexual orientation?

☐ Yes

☐ No

*Response required

8.22.10. EEO Policies and Practices - 7*

Has the bidder notified all of its sub-bidders of their obligations to comply with the Equal Opportunity requirements either in writing, by inclusion in subbidders or purchase orders?

☐ Yes

☐ No

*Response required

8.22.11. EEO Policies and Practices - 8*

Is the Company a state certified minority/female owned business? If yes, please attach a copy of the state certification. If not, please provide a document stating that your company is not a state certified minority/female owned business.

*Response required

8.22.12. EEO Policies and Practices - 9*

Does the Company have collective bargaining agreements with labor organizations?

☐ Yes

☐ No

*Response required

8.22.13. EEO Policies and Practices - 10*

Has the labor organization been notified of the Company's responsibility to comply with the Equal Employment Opportunity requirements in all contracts by the City of Bloomington?

☐ Yes

☐ No

*Response required

8.22.14. Employment Information*

Identify the geographical area(s) from which the company may reasonably recruit employees (use city, county, SMSA, or distance in miles from your company location.

*Response required

8.22.15. Under-Utilized Workforce*

If minorities and women are currently under-utilized in your workforce, please attach a copy of an explanation for your plan to recruit and hire minorities and women. If this does not pertain to your organization, please provide documentation stating that.

*Response required

*8.22.16. Workforce Analysis Form**

Please download the below documents, complete, and upload.

- Workforce_Analysis_Form.pdf

*Response required

*8.22.17. Certification**

The Company certifies that it has answered all of the foregoing questions truthfully to the best of its knowledge and belief. The Company also agrees that it will comply and abide by the City of Bloomington's Contract Compliance Ordinance and the City of Bloomington Human Relations Ordinance.

☐ Please confirm

*Response required

REGULAR AGENDA ITEM NO. 8.A

FOR COUNCIL: October 10, 2022

WARD IMPACTED: City-Wide Impact

SUBJECT: Consideration and action to approve the IATSE Local 193 Contract, as requested by the Human Resources Department.

RECOMMENDED MOTION: The proposed Contract be approved.

STRATEGIC PLAN LINK:
Goal 1. Financially Sound City Providing Quality Basic Services

STRATEGIC PLAN SIGNIFICANCE:
Objective 1d. City services delivered in the most cost-effective, efficient manner

BACKGROUND: IATSE Local 193 representing the employees at the Arena and Bloomington Center for Performing Arts (BCPA) and City staff began negotiating the terms of a Collective Bargaining Agreement and Memorandum of Understanding (MOU) to replace the agreements that expired on April 30, 2022. The expired agreement can be located on the City's website under Human Resources in a folder titled Labor Contracts. After several meetings, the parties agreed to the terms of the new contract and a tentative agreement on September 19, 2022.

Highlights from the tentative agreement include:

- Wages/Term: The parties agreed to a two (2) year contract term. In the first year of the contract, employees will receive an across the board increase retroactive back to May 1, 2022 of 2.5%. The parties agree to increase the BCPA wage rates to those of the Arena for the positions that overlap the two facilities. The across the board increase in the second year of the contract is effective May 1, 2023 at 2.5%.
- BCPA Crewheads shall include Head Carpenter, Head Electrician, Head Flyman/Deckhand, Head Audio, Head Wardrobe and Head Props
- Video Operators will be paid at the Arena worker rate. The utilization for such positions at shows is at the discretion of the City
- Agreement on eligible hours individuals can work to avoid IMRF eligibility
- Calls of more than 10 stagehands will require a Steward
- Call time minimums are now set at two (2) hour Load In and two (2) hour Load Out for educational or straight truck events
- Presets and restores shall be separate calls with two (2) hour minimums
- Meal Period language was updated to reflect a 60-minute unpaid lunch within the third and fifth hours or a 30-minute paid lunch with a fresh meal. If no meal break is provided after 5 hours, overtime will be paid until such meal period is granted.
- The prior MOU addressed pay, benefits, and terms and conditions of employment that deviated from the original BCPA contract. The MOU was originally signed by the parties after the City took over day-to-day operations at the Arena. The MOU addresses the

following:

- Scope of Bargaining Unit Work at the Arena. Language was modified so the City has discretion over the following work:
  - Installation and tear down of the Arena Pro Deck, glass, and dasher boards
  - Video Camera Operations
- Modification of the Steward's role
- Ability for Management to notify the Union of staff ineligible to be assigned for failing to report for assignments
- Staffing minimums for:
  - Load In and Load Out of shows depending on size of vehicles
  - Requirement for a Lead Stagehand or Steward depending on number of Stagehands assigned for a show
  - Number of required Down Riggers will be based on the number of Up Riggers
- Call time minimums will be four (4) hours for a show call and four (4) hours for a Load In and Load Out
- Memorializing the City's ability to sell or enter into a long-term lease, etc. without a duty to bargain with the Union
- Memorializing pay for Live Recordings. Such recordings for Commercial sale require staff to be paid twice their hourly rate for the duration of the live recording. Non-Commercial Live Recording Purposes will not be compensated at twice the employee's hourly rate.
- IATSE Steward will schedule staff all shows. In the event they are unable to fill the show they will notify the City one week prior which will allow the City to staff with a non-bargaining unit (IATSE employees). Maintenance calls with 10 or less employees shall be scheduled by management.
- Job Descriptions were created

COMMUNITY GROUPS/INTERESTED PERSONS CONTACTED: N/A

FINANCIAL IMPACT: IATSE staff only work for shows/events preparation and performances, training or scheduled maintenance. Staff expenditures are therefore partially offset by show revenues, rising and falling given show volume. Traditionally, estimates for contractual impacts were projected off of the prior year's data. However, given the limited performances due to COVID and the transition of management at the Arena, staff is unable to provide an impact based on those criteria. Stakeholders can locate information on the BCPA in the FY 2023 Budget Book titled "Budget Overview & General Fund" on pages 196 through 202. Stakeholders can locate information on the Arena in the FY 2023 Budget Book titled "Other Funds & Capital Improvement" on pages 184 through 195.

AMERICAN RESCUE PLAN FUNDING IMPACT: N/A

COMMUNITY DEVELOPMENT IMPACT: **This request meets the following goals and objectives of the Bloomington Comprehensive Plan 2035**: N/A

Respectfully submitted for consideration.

Prepared by: Angie Brown, Assistant Human Resources Manager

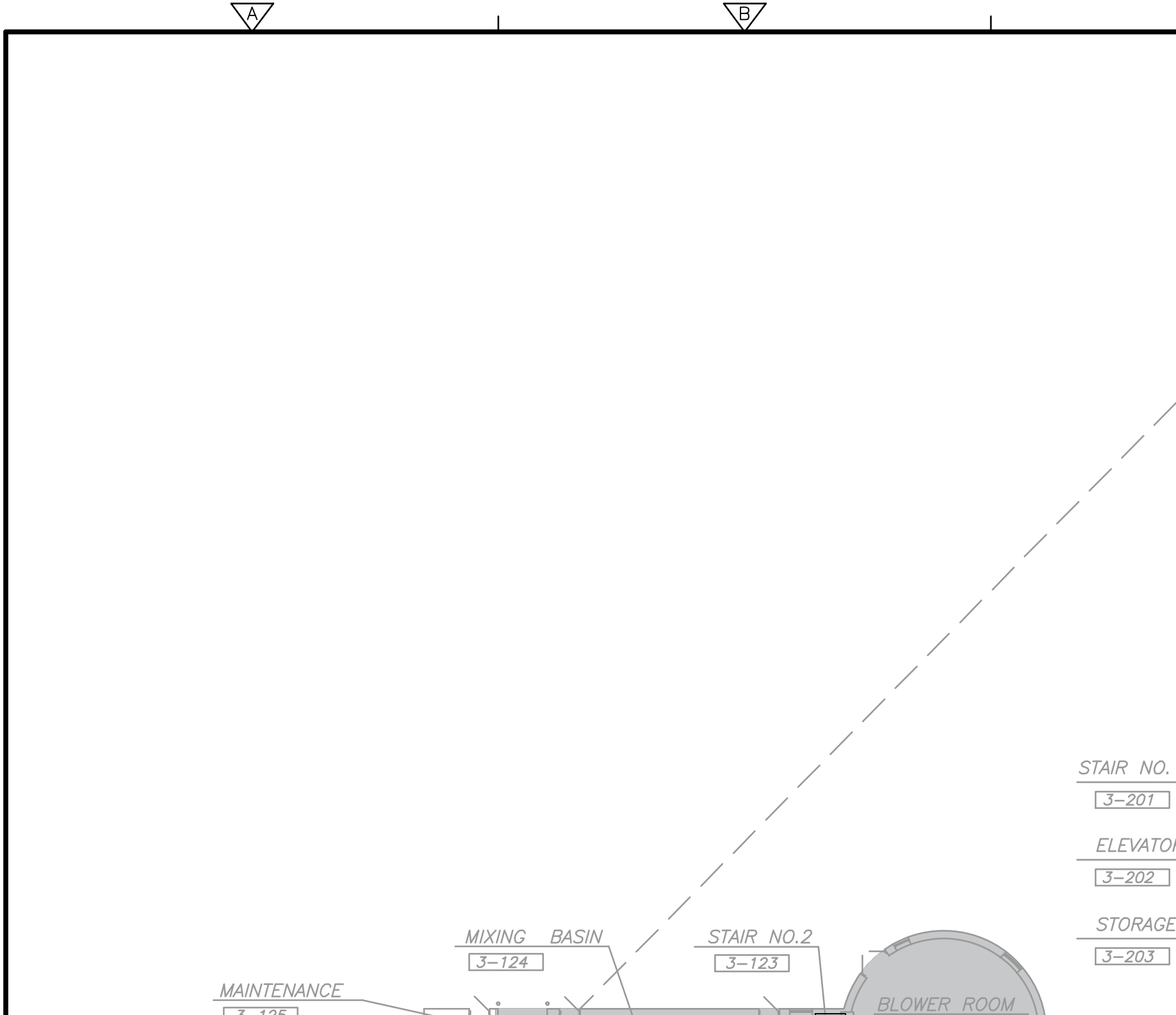
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SHEET INDEX

SHEET	DRAWING NAME
GENERAL	
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G–1	SHEET INDEX
G–2	AREA CLASSIFICATION
G–3	SITE PLAN
G–4	GENERAL NOTES
G–5	PROJECT ABBREVIATIONS AND LEGEND
G–6	AMMONIA SYSTEM DEMOLITION AND CONSTRUCTION PHASES 1 &
G–7	AMMONIA SYSTEM DEMOLITION AND CONSTRUCTION PHASES 3
MECHANICAL	
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S–1	STRUCTURAL GENERAL NOTES ABBREVIATIONS AND LEGEND
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HVAC	
H–1	HVAC LEGEND, ABBREVIATIONS, GENERAL NOTES AND SCHEDULES

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GENERAL NOTES (ALL WORK REQUIRED BY THESE GENERAL NO

SURVEY AND SUBSURFACE UTILITIES

1. THE SURVEY FOR THIS PROJECT WAS PERFORMED BY RHMG ENGINEERING, UTILIZING FIELD SURVEY.
2. THE SURVEY INFORMATION PROVIDED ON THESE PLANS MAY OR MAY NOT SHOW ALL CURRENTLY EXISTING STRUCT UTILITIES ABOVE OR BELOW THE GROUND.
3. THE SURVEY INFORMATION CONTAINED ON THESE DRAWINGS MAY NOT SHOW OR INCLUDE LOCATION OF ALL EXISTI
4. CONSTRUCTION SURVEYING IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR PRIOR TO BEGINNING CONSTRUCTION

REGULATORY PERMITTING AND SAFETY

1. CONTRACTOR SHALL ABIDE BY ALL APPLICABLE GOVERNMENTAL AND REGULATORY STANDARDS AND REQUIREMENTS CONTRACTOR SHALL OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FOR CONSTRUCTION SHOWN DRAWINGS, CONTRACTOR SHALL ABIDE BY REQUIREMENTS OF CITY AND COUNTY PERMITS OBTAINED BY THE OWNER CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR ARRANGING AND COORDINATING ALL REQUIRED INSPECTIONS BY R AGENCIES INCLUDING PROVIDING ALL LABOR, EQUIPMENT AND MATERIALS NECESSARY TO ACCOMMODATE THE INSPE
2. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MAINTAINING SAFETY, INCLUDING GENERAL SAFETY AT AND ADJA WORK AREA, THE PERSONAL SAFETY OF THE CONSTRUCTION STAFF AND THE GENERAL PUBLIC, AND FOR THE SAF PUBLIC AND PRIVATE PROPERTY.
3. CONTRACTOR SHALL FOLLOW STORMWATER POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL AS IN THE CONTRACT DOCUMENTS

GENERAL AND CONSTRUCTION

1. THE CONTRACTOR SHALL VERIFY DIMENSIONS AND SITE CONDITIONS IN THE FIELD AND REPORT ANY DISCREPANCY ENGINEER PRIOR TO COMMENCING WORK.
2. THE CONTRACTOR SHALL TAKE ALL NECESSARY SAFETY PRECAUTIONS TO PROTECT ABUTTING PROPERTY, UTILITIES, AND VEHICULAR TRAFFIC TO THE SATISFACTION OF THE APPROPRIATE OWNER OR AUTHORITY.
3. CONTRACTOR SHALL NOT BLOCK ACCESS TO FIRE HYDRANTS, OR BUILDING FIRE SERVICE CONNECTIONS AT ANY TI THE PERFORMANCE OF THE WORK. ACCESS SHALL BE MAINTAINED AT ALL TIMES UNLESS OTHERWISE APPROVED B FIRE DEPARTMENT OR OTHER GOVERNING AGENCY.
4. MATERIAL OR EQUIPMENT SHALL NOT BE STORED ON OR RESTRICT ACCESS TO VALVE BOXES, MANHOLES, VAULTS, APPURTENANCES ASSOCIATED WITH OTHER UTILITY SYSTEMS.

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LEGEND

EXISTING FEATURES

- EXIST PROPERTY LINE
- EXIST RIGHT–OF–WAY LINE
- EXIST PROPERTY SETBACK
- EXIST SECTION LINE
- EXIST DEPRESSED CURB
- EXIST CHAIN–LINK FENCE
- EXIST WOOD FENCE
- EXIST WIRE FENCE
- EXIST WROUGHT IRON FENCE
- EXIST STORM LINE
- EXIST SANITARY LINE
- W — EXIST WATERMAIN LINE
- G — EXIST UNDERGROUND GAS
- E — EXIST UNDERGROUND ELECTRICAL
- TS — EXIST UNDERGROUND TRAFFIC SIGNAL
- T — EXIST UNDERGROUND TELEPHONE
- TV — EXIST UNDERGROUND CABLE TV
- OH — EXIST OVERHEAD WIRES
- LA — EXIST LANDSCAPE AREA
- EXIST GUARD RAIL
- Ⓜ EXIST MISCELLANEOUS MANHOLE (MH)
- EXIST STORM INLET (INL)
- EXIST FLARED END SECTION
- DS EXIST DOWN SPOUT

- 8" EXIST DECIDUOUS TREE WI
  TRUNK DIAMETER IN INC
- 8" EXIST CONIFEROUS TREE W
  TRUNK DIAMETER IN INC
- EXIST MULTI–TRUNK TREE
  POINT NUMBER
- EXIST BITUMINOUS PAVEMEI
- EXIST CONCRETE
- EXIST AGGREGATE
- EXIST BRICK

PROPOSED FEATURES–PLAN

- PROPOSED CONTRACTOR LA
  AREAS AND JACK & BORE
- REMOVAL HATCH
- FLOW ARROW

PHOTO LOCATION AND DIRECTION

1 — PHOTO NUMBER

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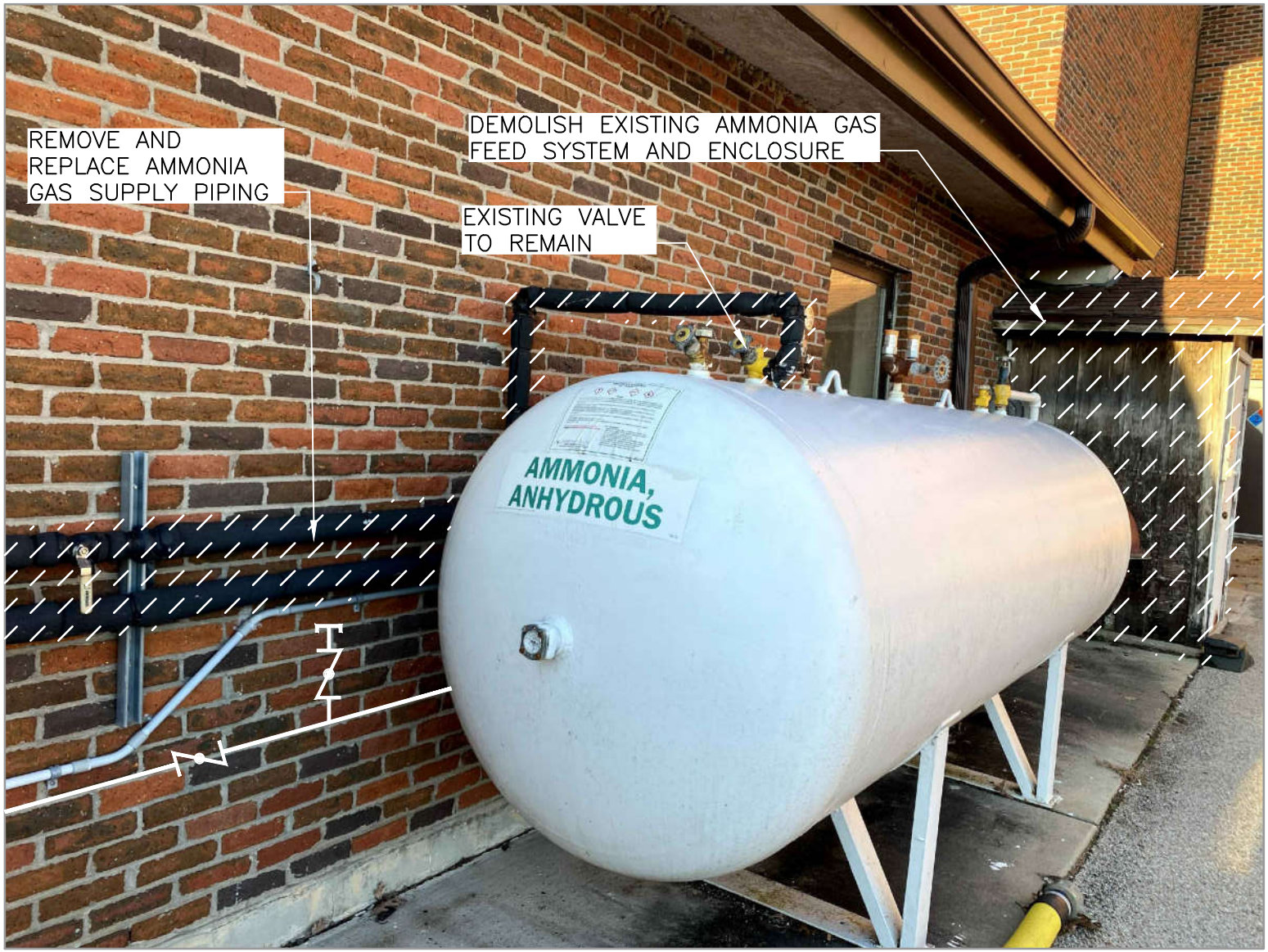
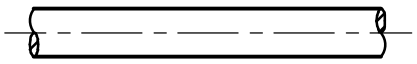
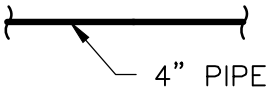
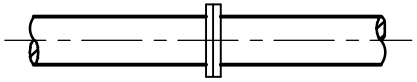
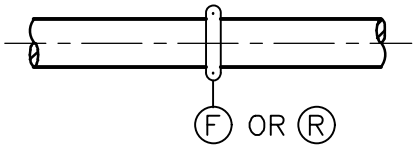
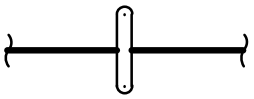
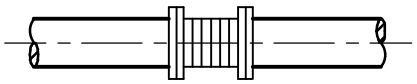
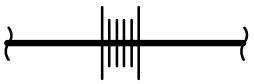
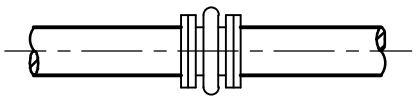
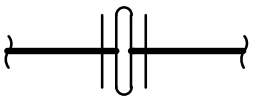
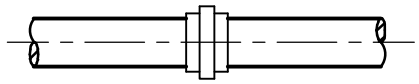
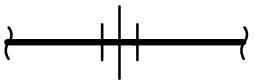
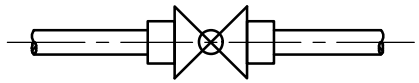
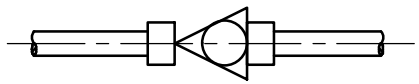
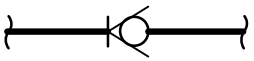


PHOTO 6

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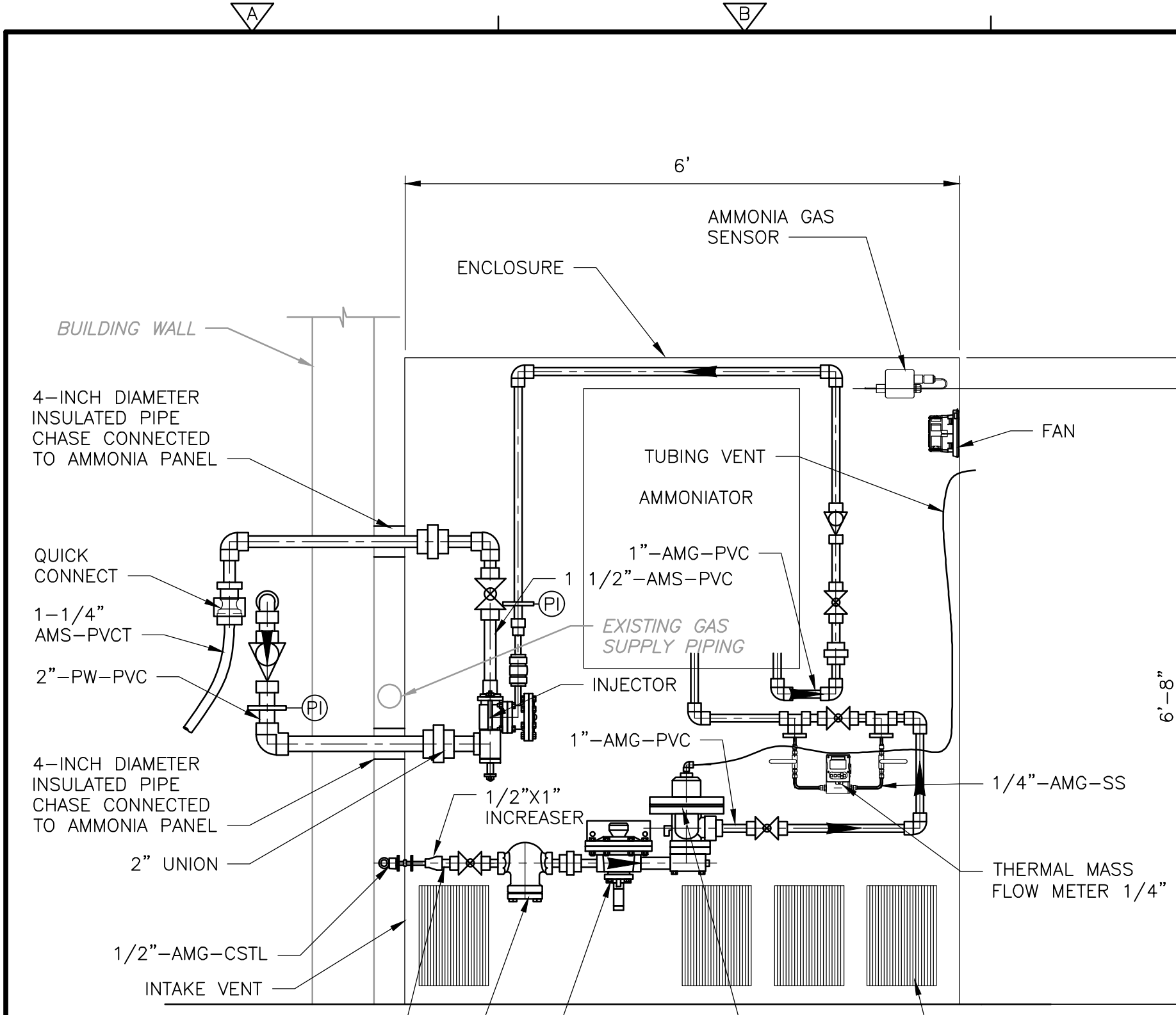
A B

PIPE, FITTING AND VALVE SYMBOLS

DOUBLE LINE SYMBOL	SINGLE LINE SYMBOL	FEATURE
		PROCESS PIPING 4" PIPE AND SMALLER ON PLAN VIEWS
		EXISTING PROCESS PIPING
		FLANGED JOINT (SEE NOTE 1)
		COUPLING FOR GROOVED END JOINTS: Ⓕ FLEXIBLE Ⓡ RIGID
		FLEXIBLE COUPLING OR EXPANSION JOINT (SLEEVE TYPE)
		FLEXIBLE COUPLING OR EXPANSION JOINT (BELLOWS TYPE)
		UNION COUPLING
		BALL VALVE (BV)
		BALL CHECK VALVE (BCV)

Ⓕ OR Ⓡ

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STRUCTURAL NOTES

A. GENERAL NOTES

1. ALL STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH THE OTHER PROJECT DRAWINGS AND SPECIFICATIONS.

2. SEE CIVIL, ELECTRICAL, ARCHITECTURAL, PLUMBING AND HVAC DRAWINGS FOR ANCHORS, PIPE SLEEVES, CONDUITS, DOORS, WINDOWS, LOUVERS, DUCTWORK OR OTHER ITEMS TO BE EMBEDDED IN OR PASS THROUGH THE CONCRETE OR MASONRY. IN GENERAL, EMBEDMENTS AND PENETRATIONS LESS THAN 12 INCHES IN DIAMETER ARE NOT SHOWN ON STRUCTURAL DRAWINGS.

3. THE CONTRACTOR SHALL REVIEW AND VERIFY DIMENSIONS SHOWN IN ALL PLANS AND REVIEW ALL FIELD CONDITIONS THAT MAY AFFECT THE INSTALLATION OF THE STRUCTURE, SHOULD DISCREPANCIES APPEAR, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING TO OBTAIN ENGINEER'S CLARIFICATION BEFORE COMMENCING THE WORK.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR STRUCTURAL STABILITY DURING CONSTRUCTION. THE STRUCTURE SHOWN ON THE DRAWINGS HAS BEEN DESIGNED FOR STABILITY UNDER THE FINAL CONFIGURATION ONLY.

5. WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALED SIZES.

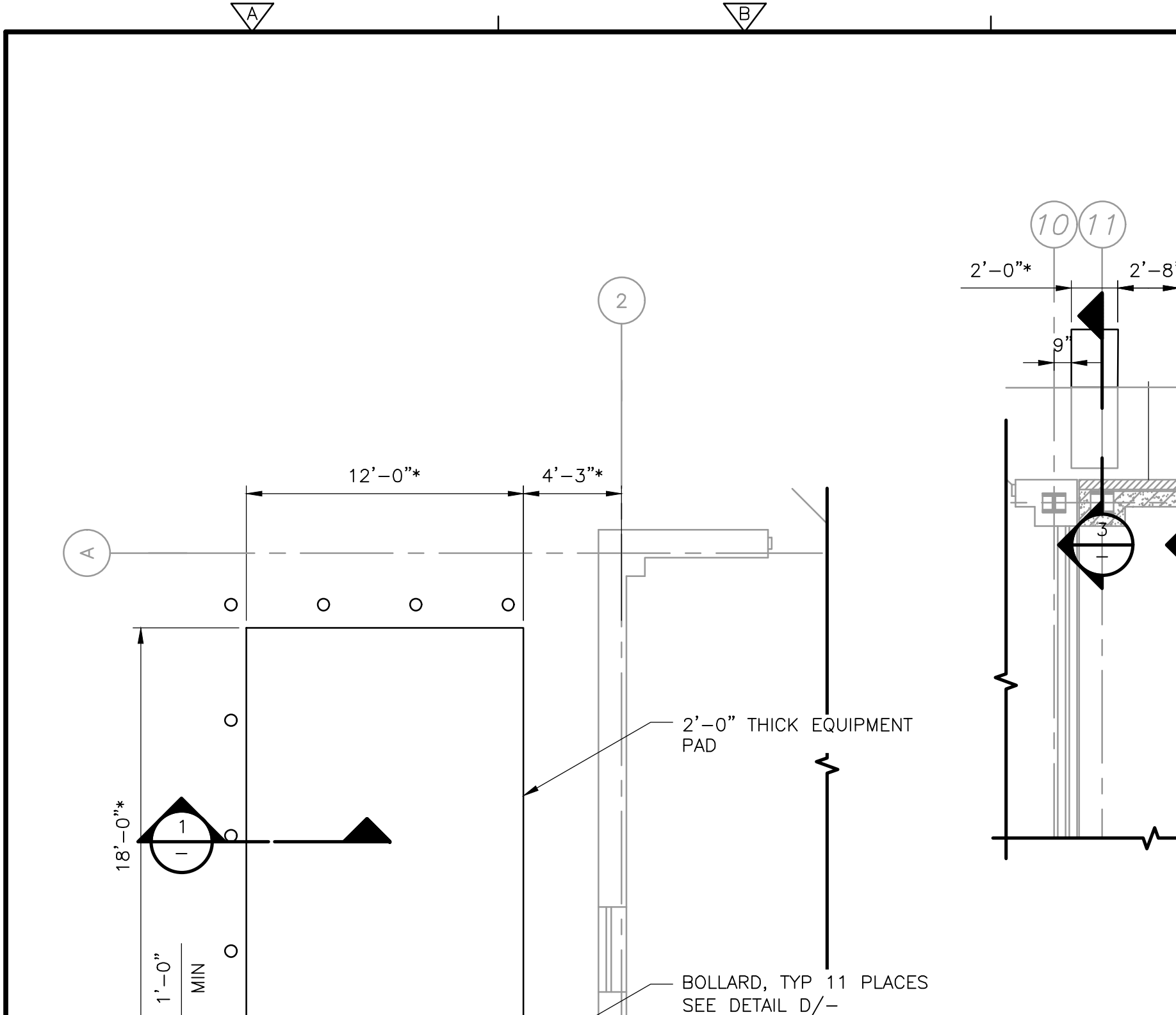
B. DESIGN CRITERIA

1. BUILDING CODES:
   a. 2018 INTERNATIONAL BLDG CODE, ASCE 7-16
   b. ACI 318-14

2. WIND LOADS:
   BASIC WIND SPEED = 120 MPH
   EXPOSURE CATEGORY = C
   IMPORTANCE FACTOR = 1.0

3. SEISMIC LOADS:
   RISK CATEGORY OF BUILDING II
   SEISMIC DESIGN CATEGORY = B
   SOIL SITE CLASS = D
   IMPORTANCE FACTOR = 1.00
   Ss = 0.147; S1 = 0.082
   Sds = 0.156; Sd1 = 0.131

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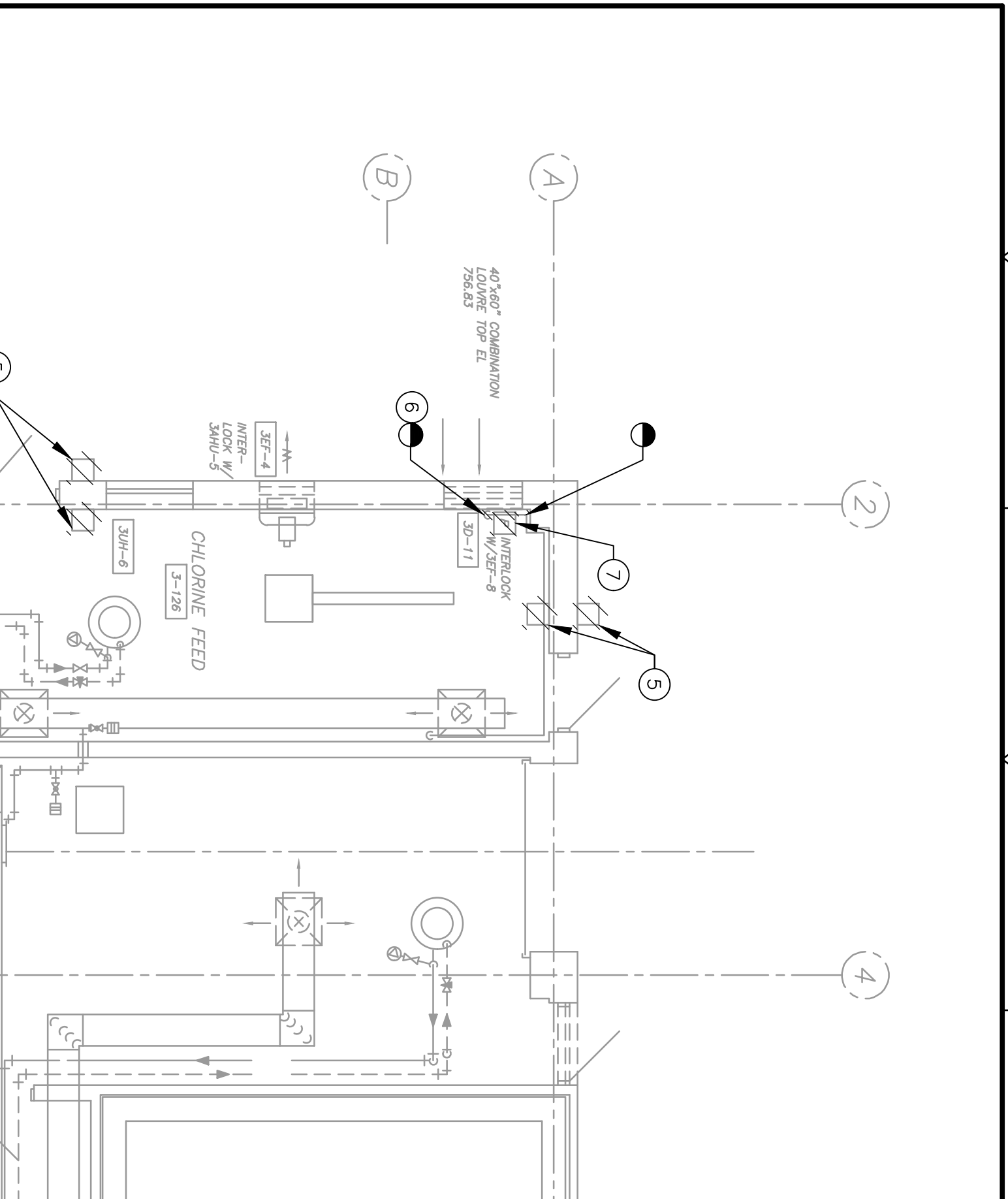
A B

LEGEND

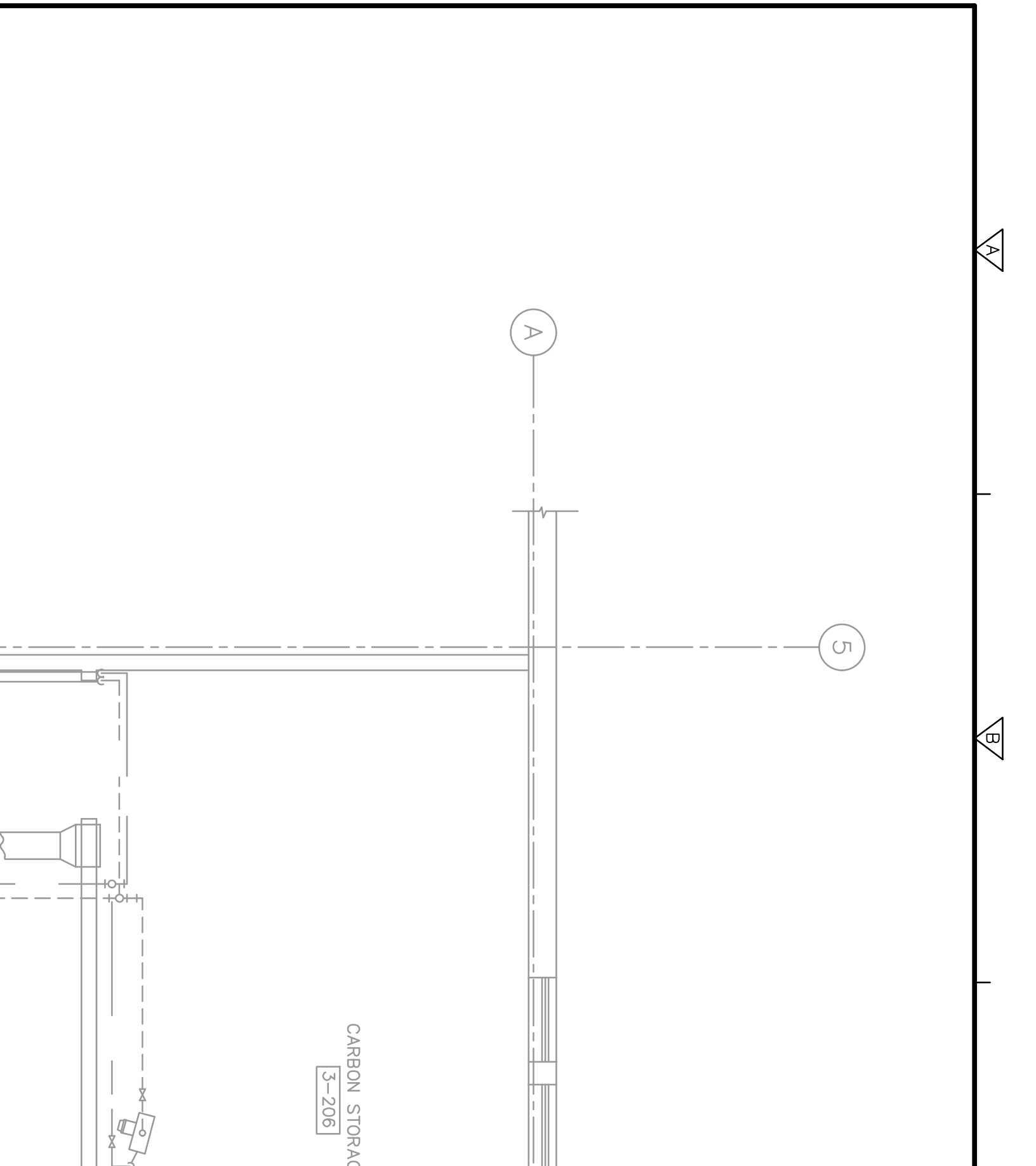
SINGLE LINE	DOUBLE LINE	
20X12	20X12	FIRST DIMENSION DENOTES VIEW SHOWN; RECT. OR OVAL
		TRANSITION, 18" MIN. LENGTH, 15° MAX. EACH SIDE. ROUND OR RECT.
		RECT. TO ROUND TRANSITION
		90° ELL W/TURNING VANES
		45° HEEL TAKE–OFF FITTING, RECT.
		CONICAL OR FLARED SPIN–IN OR CONICAL TAP
18ø	18ø	18 INCH ROUND DUCT
	D R	ROUND DUCT ELBOW; R/D=1.5MIN.
		90° STRAIGHT TEE FITTING
		90° CONICAL TEE FITTING
		45° LATERAL FITTING
		45° CONICAL LATERAL FITTING
		DIVIDED FLOW FITTING

ACC	AIR COOL
ACH	AIR CHAN
ACU	AIR COND
AFF	ABOVE FIN
AL	ALUMINUM
ATC	AUTOMATIC
BD	BALANCIN
BDD	BACKDRAF
BHP	BRAKE HO
BI	BACKWARD
BOD	BOTTOM O
BTUH	BRITISH T
CD	CONDENSA
CFH	CUBIC FE
CFM	CUBIC FE
CU. FT.	CUBIC FE
DB	DRY BULE
DIA	DIAMETER
DIV	DIVISION
DN	DOWN
EA	EXHAUST
EAT	ENTERING
EF	EXHAUST
EG	EXHAUST
ESD	EMERGENC
ESP	EXTERNAL
EUH	ELECTRIC
°F	DEGREES
FD	FIRE DAM

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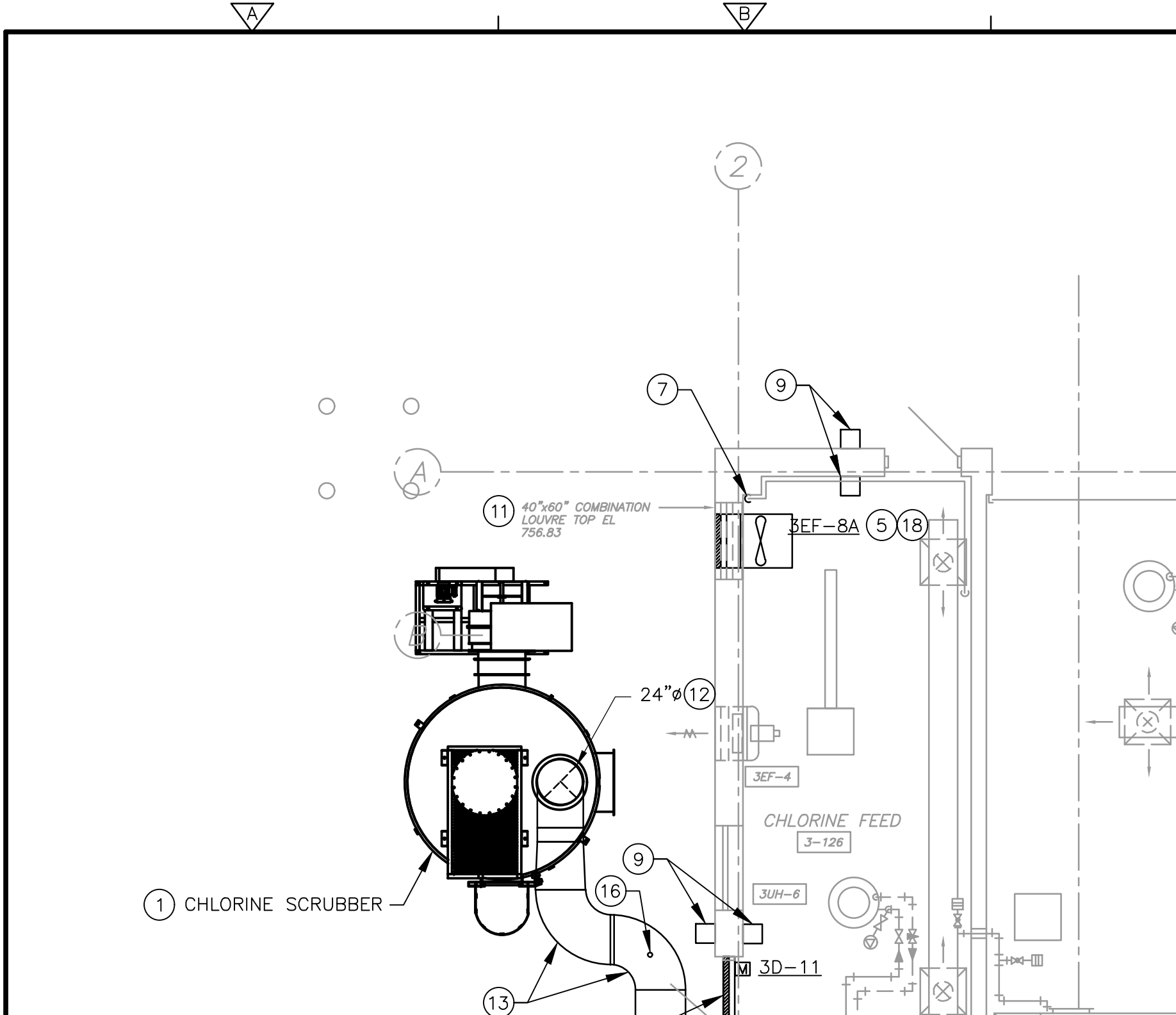


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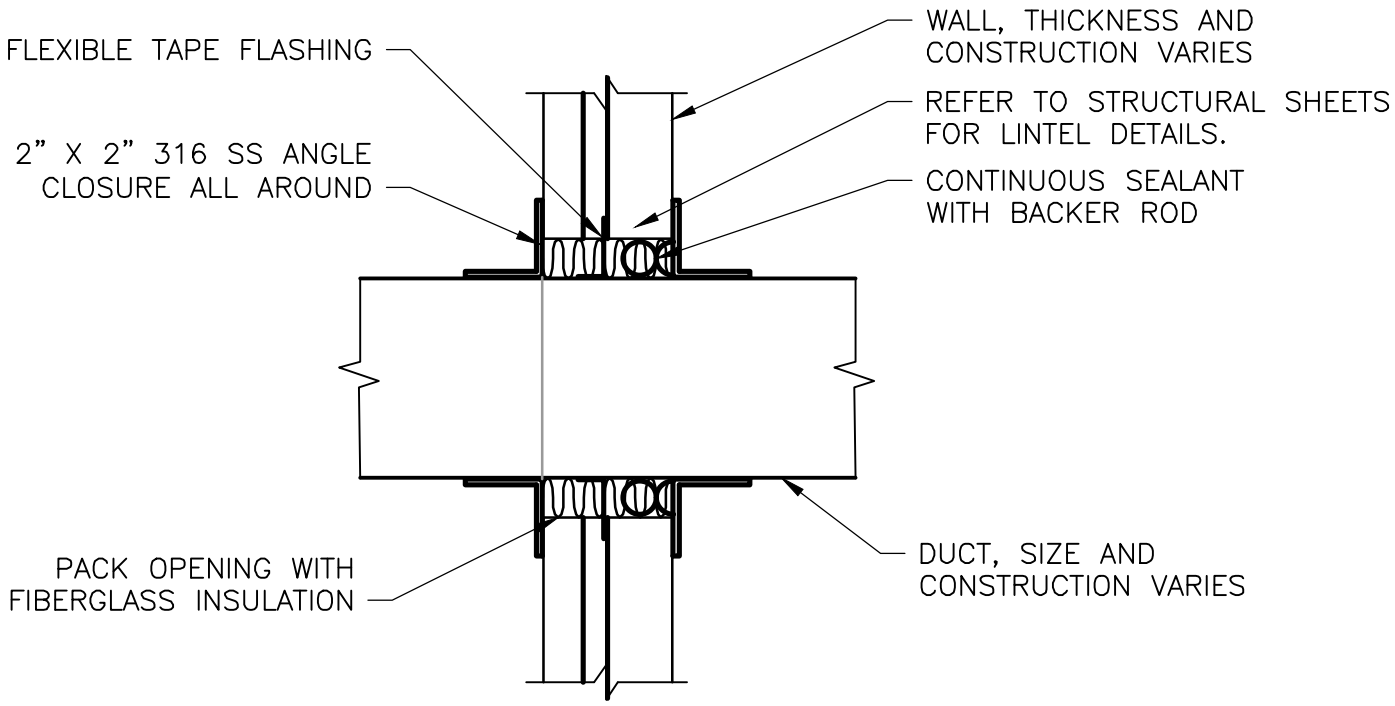


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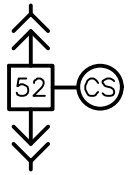
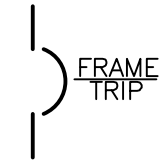
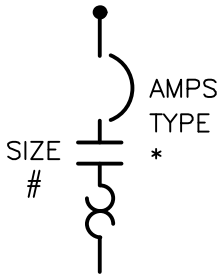
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DUCT WALL PENETRATIONS TO BE USED FOR ALL EXTERIOR NON-FIRE RATED WA

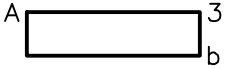
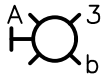
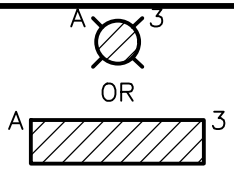
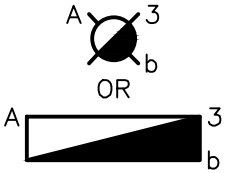
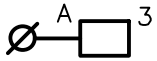
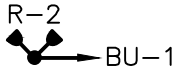
DETAIL A

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ONE LINE OR CONTROL DIAGRAM	PLAN	DESCRIPTION
	——	MEDIUM VOLTAGE DRAWOUT TYPE POWER CIRCUIT BREAKER CS=CONTROL SWITCH
	CB	LOW VOLTAGE AIR OR MOLDED CASE CIRCUIT BREAKER, 3 POLE UNLESS OTHERWISE NOTED.
		COMBINATION MOTOR CIRCUIT PROTECTOR AND MAGNETIC MOTOR STARTER, FULL VOLTAGE NON–REVERSING UNLESS OTHERWISE NOTED: * FVR – FULL VOLTAGE REVERSING RVNR – REDUCED VOLTAGE NON–REVERSING RVAT – REDUCED VOLTAGE AUTOTRANSFORMER RVSS – REDUCED VOLTAGE SOLID STATE 2S1W – TWO SPEED, ONE WINDING 2S2W – TWO SPEED, TWO WINDING (DIAGRAMMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)
		NON–FUSIBLE DISCONNECT SWITCH, 600 VOLT, 3 POLE * AMPERE RATING NOTED IF OTHER THAN 30A (DIAGRAMMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)
	F	FUSIBLE DISCONNECT SWITCH, 600 VOLT, 3 POLE, * AMPERE RATING AND FUSE SIZE AS NOTED ✸ AMPERE RATING NOTED IF OTHER THAN 30A FUSE RATING (DIAGRAMMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)
		MANUAL MOTOR STARTER WITH THERMAL OVERLOAD HEATER, 1 POLE UNLESS OTHERWISE NOTED "P" INDICATES WITH PILOT LIGHT "2" INDICATES TWO POLE (DIAGRAMMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)

ONE LINE OR CONTROL DIAGRAM	PLAN
	——
	

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SYMBOL	DESCRIPTION
	LIGHTING FIXTURE "A" – FIXTURE TYPE (SEE LIGHTING FIXTURE SCHEDULE) "b" – CONTROLLED BY SWITCH "b" "3" – CIRCUIT NUMBER
	LIGHTING FIXTURE, NOTATIONS SAME AS ABOVE
	WALL MOUNTED TYPE LIGHTING FIXTURE, NOTATIONS SAME AS ABOVE
	CROSS HATCH INDICATES LIGHTING FIXTURE THAT IS UNSWITCHED AND SHALL REMAIN ON AT ALL TIMES. NOTATIONS SAME AS ABOVE.
	SHADED AREA INDICATES LIGHTING FIXTURE THAT IS EQUIPPED WITH EMERGENCY BACKUP POWER SOURCE. NOTATIONS SAME AS ABOVE.
	POLE MOUNTED AREA TYPE LIGHTING FIXTURE, NOTATIONS SAME AS ABOVE
	POLE MOUNTED ROADWAY TYPE LIGHTING FIXTURE, NOTATIONS SAME AS ABOVE
	EMERGENCY LIGHTING BATTERY UNIT WITH TWO LAMP HEADS "EM" – FIXTURE TYPE (SEE LIGHTING FIXTURE SCHEDULE) "3" – SUPERVISORY CIRCUIT * – FIXTURE TAG #
	REMOTE EMERGENCY ADJUSTABLE WALL LIGHTING FIXTURE WITH TWO LAMP HEADS "R–2" – FIXTURE TYPE (SEE LIGHTING FIXTURE SCHEDULE) * – HOME RUN TO BATTERY UNIT INDICATED. CONDUIT SHALL BE 3/4" AND CONTAIN (2) NO. 12 AWG BRANCH CIRCUIT CONDUCTORS AND (1) NO. 12 AWG GROUND CONDUCTOR UNLESS OTHERWISE INDICATED.

SYMBOL	
$\$_a$	SINGLE POLE SW
$\$_a^2$	DOUBLE POLE S
$\$_c^3$	THREE WAY SWIT
$\$_a^4$	FOUR WAY SWITC
$\$_a^D$	DIMMER SWITCH
$\$_{OS}$	SINGLE POLE SWIT "OS" INDICATES A
$\$_{OS}^2$	DOUBLE POLE SWI "OS" INDICATES PR INBOARD/OUTBOAR
$\$_{DT}$	SINGLE POLE SWIT "DT" INDICATES DU CAPABLE OF SENS
C 3	LIGHTING CONTAC
TM	TIME SWITCH
	PUSH BUTTON S
TYPE A	INDICATES ALL L WHICH THIS NOT OTHERWISE NOTE
	LIGHTING PANELE SHOWN ON PLAN
	POWER PANELBO SHOWN ON PLAN
	LIGHTING CONTAC SHOWN ON PLAN

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SCOPE OF WORK:

1. PROJECT PROVIDES ELECTRICAL SYSTEM UPGRADES ASSOCIATED WITH THE NEW CHLORINE SCRUBBER SYSTEM AND NEW AMMONIA FEED SYSTEM AT THE CITY OF BLOOMINGTON WATER TREATMENT PLANT. MAJOR IMPROVEMENTS INCLUDE, BUT ARE NOT LIMITED TO, NEW CONDUIT AND WIRING (POWER AND CONTROL) FOR THE NEW CHLORINE SCRUBBER AND AMMONIA FEED SYSTEM, AND MODIFICATIONS TO THE EXISTING MOTOR CONTROL CENTERS.

2. PROVIDE CONDUIT, WIRE, AND TERMINATIONS FOR MOTORS, MOTOR CONTROLLERS, CONTROL DEVICES, CONTROL PANELS, AND ELECTRICAL EQUIPMENT FURNISHED BY OTHER DIVISIONS.

3. PROVIDE CONDUIT, WIRE, AND TERMINATIONS (INCLUDING SURGE PROTECTION TERMINATIONS) FOR FIELD–MOUNTED INSTRUMENTS FURNISHED AND MOUNTED BY OTHER DIVISIONS.

4. PROVIDE CONDUIT, WIRE, AND TERMINATIONS FOR SCADA SYSTEM COMPONENTS, INCLUDING PLC CABINETS.

GENERAL NOTES:

1. ELECTRICAL DRAWINGS ARE INTENDED TO SHOW THE GENERAL LAYOUT OF WORK TO BE INSTALLED UNDER THIS CONTRACT WI ATTEMPTING TO SHOW ALL DETAILS. FURNISH LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS REQUIRED FOR A COMPLETE A OPERATIONAL ELECTRICAL SYSTEM AS SHOWN ON THE CONTRACT DOCUMENTS.

2. COORDINATE WORK WITH OTHER TRADES AND THE OWNER.

3. MAINTAIN EXISTING PROCESS OPERATIONS. POWER INTERRUPTIONS TO ELECTRICAL EQUIPMENT SHALL BE AT OWNER'S CONVENI 72 HOURS MINIMUM NOTICE. EACH INTERRUPTION SHALL HAVE PRIOR WRITTEN APPROVAL.

4. CONTRACTOR'S WORK SHALL INCLUDE COMPLETE TESTING OF EQUIPMENT AND WIRING INCLUDING MAKING MINOR CORRECTIONS OR ADJUSTMENTS NECESSARY FOR THE PROPER FUNCTIONING OF THE SYSTEM AND EQUIPMENT. WORKMANSHIP SHALL BE OF HIGHEST QUALITY; SUBSTANDARD WORK WILL BE REJECTED.

5. DO NOT SCALE ELECTRICAL DRAWINGS. REFER TO MECHANICAL, STRUCTURAL DRAWINGS, AND APPROVED MANUFACTURER'S SHO DRAWINGS FOR EXACT LOCATION OF EQUIPMENT. EXCEPT WHERE DIMENSIONS ARE SHOWN, LOCATIONS OF EQUIPMENT, FIXTUR OUTLETS, AND SIMILAR DEVICES ARE APPROXIMATE.

6. WORK SHALL COMPLY WITH NEC AND LOCAL CODES.

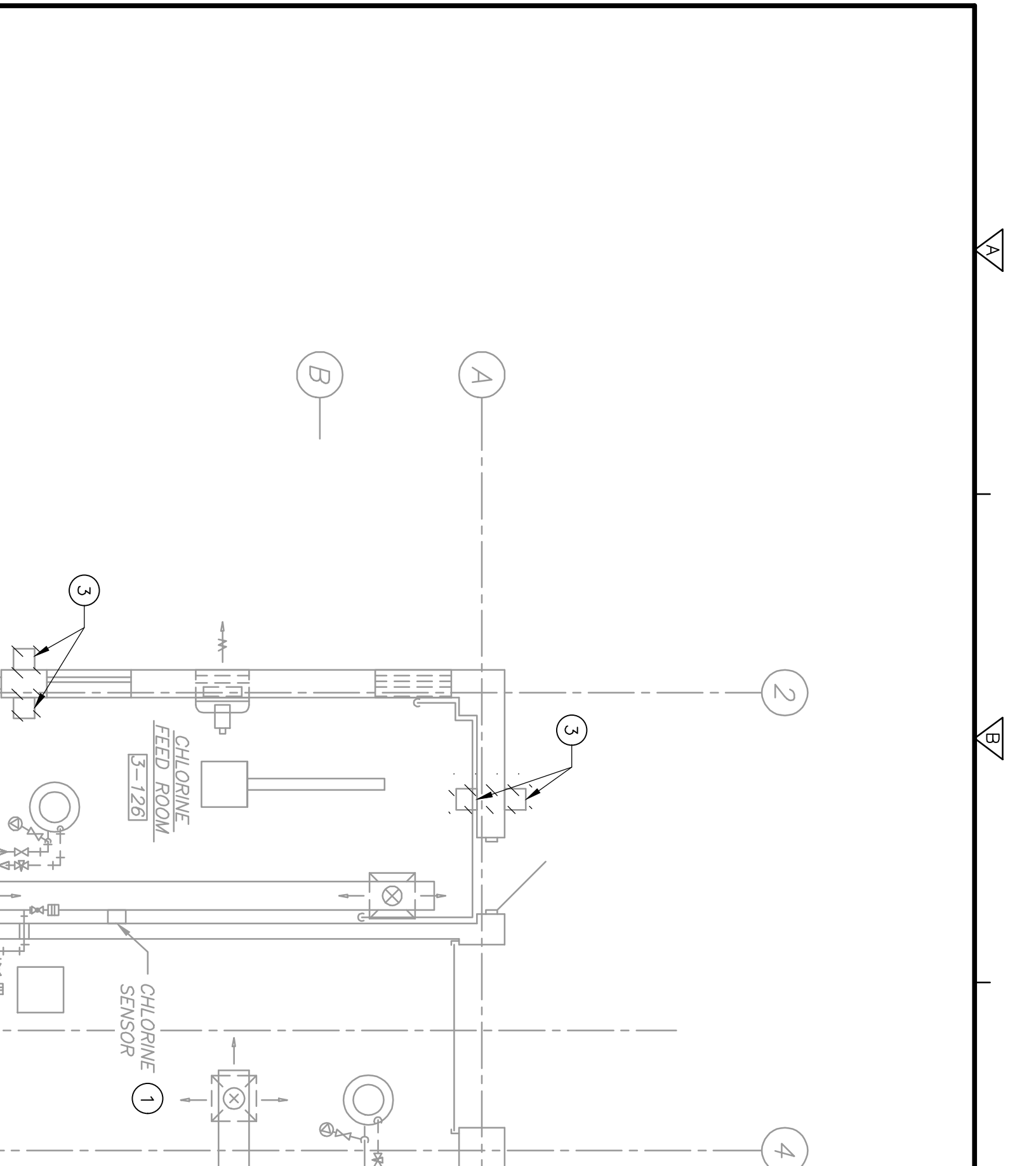
7. DO NOT SPLICE CONDUCTORS EXCEPT AS NOTED.

8. POWER AND CONTROL CONDUITS SHALL HAVE AN EQUIPMENT GROUNDING CONDUCTOR WIRE SIZED PER TABLE 250.122 OF TH (UON).

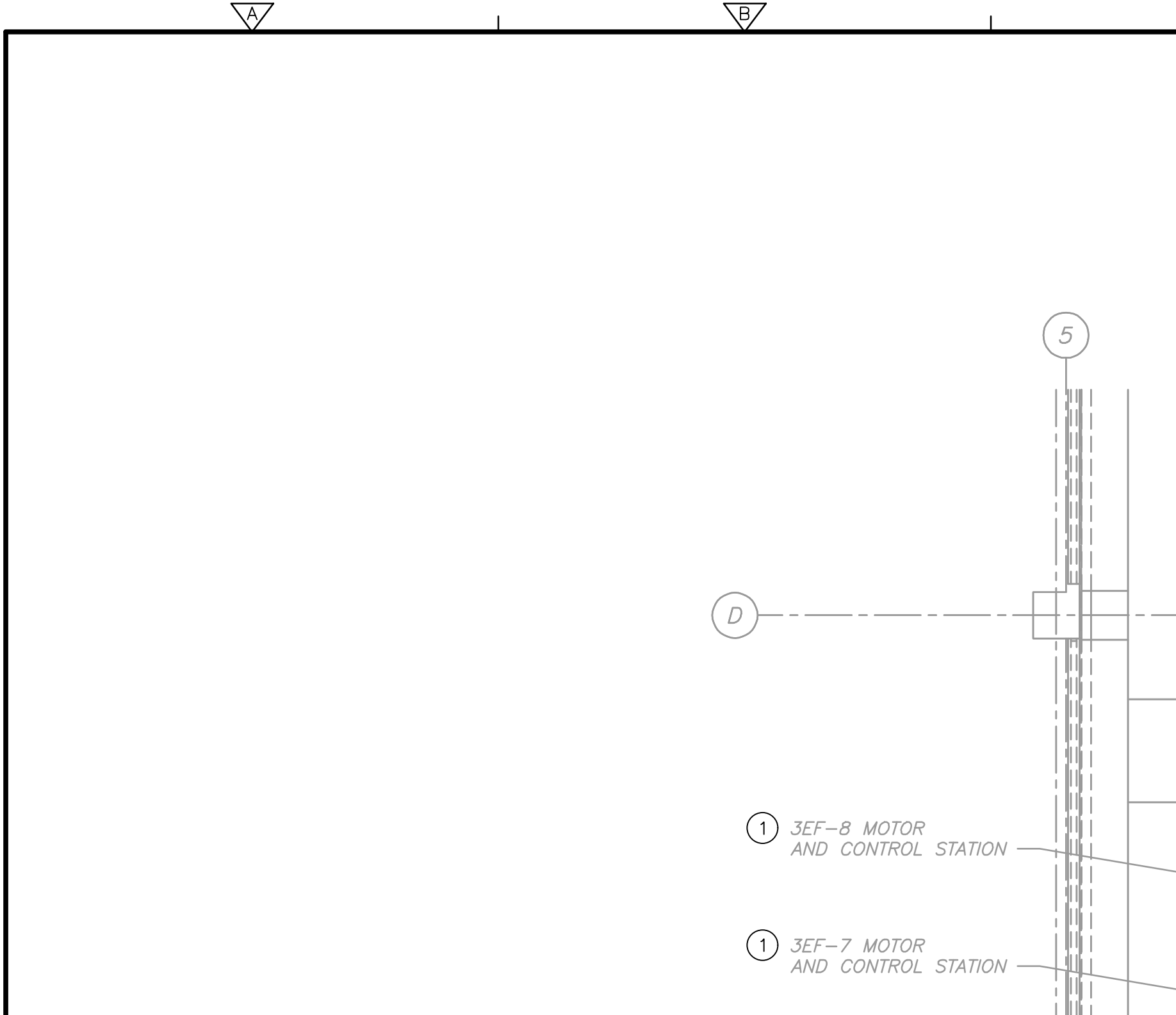
9. COORDINATE SEQUENCE OF CONSTRUCTION WITH CIVIL, MECHANICAL, AND STRUCTURAL DISCIPLINES. PROVIDE TEMPORARY POW CONTROL CIRCUITS AS REQUIRED TO MAINTAIN FACILITY OPERATION. VERIFY EXISTING UTILITIES IN AREA OF CONSTRUCTION.

10. CONDUITS RUN AT EXISTING STRUCTURES SHALL BE RUN EXPOSED.

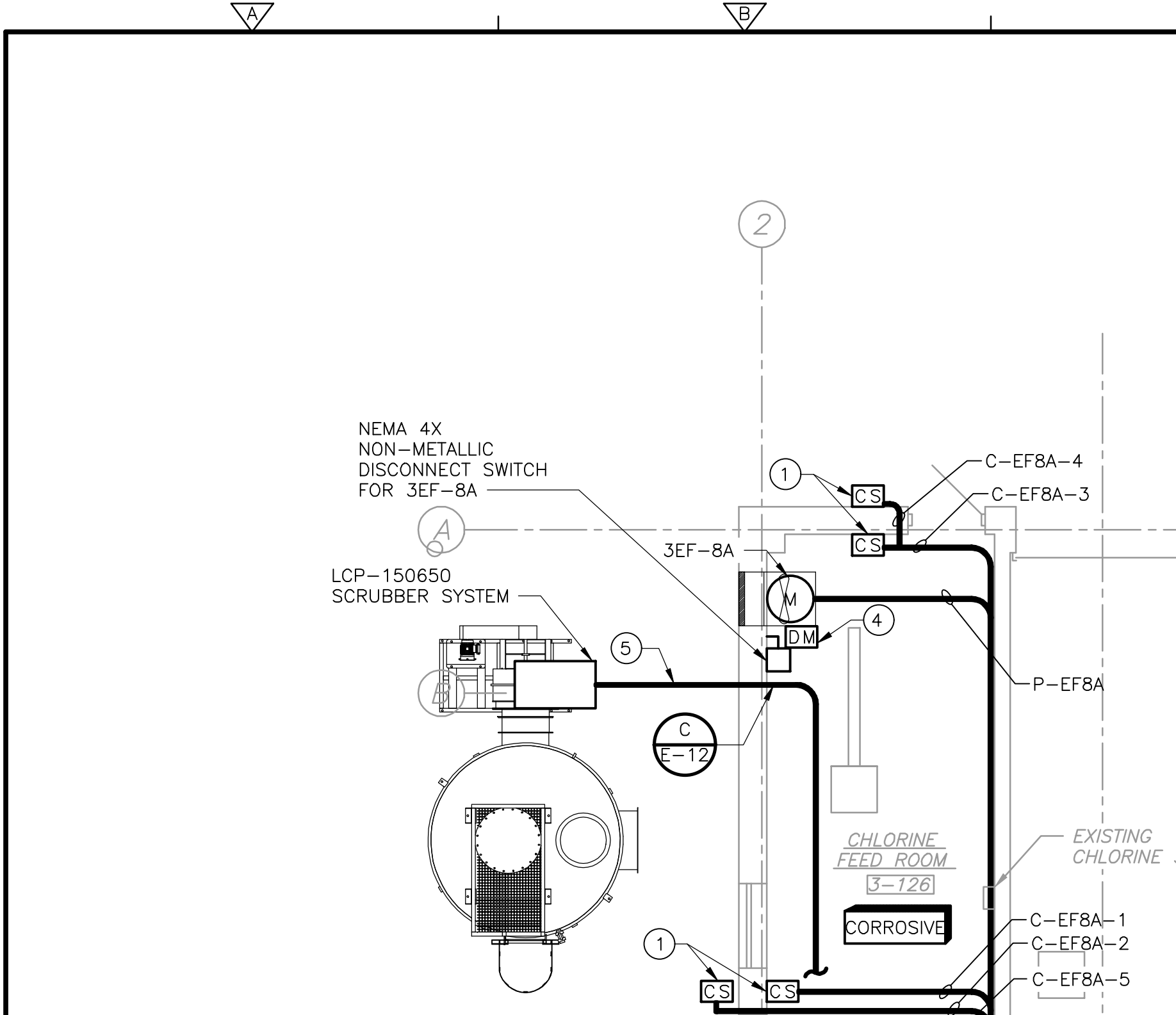
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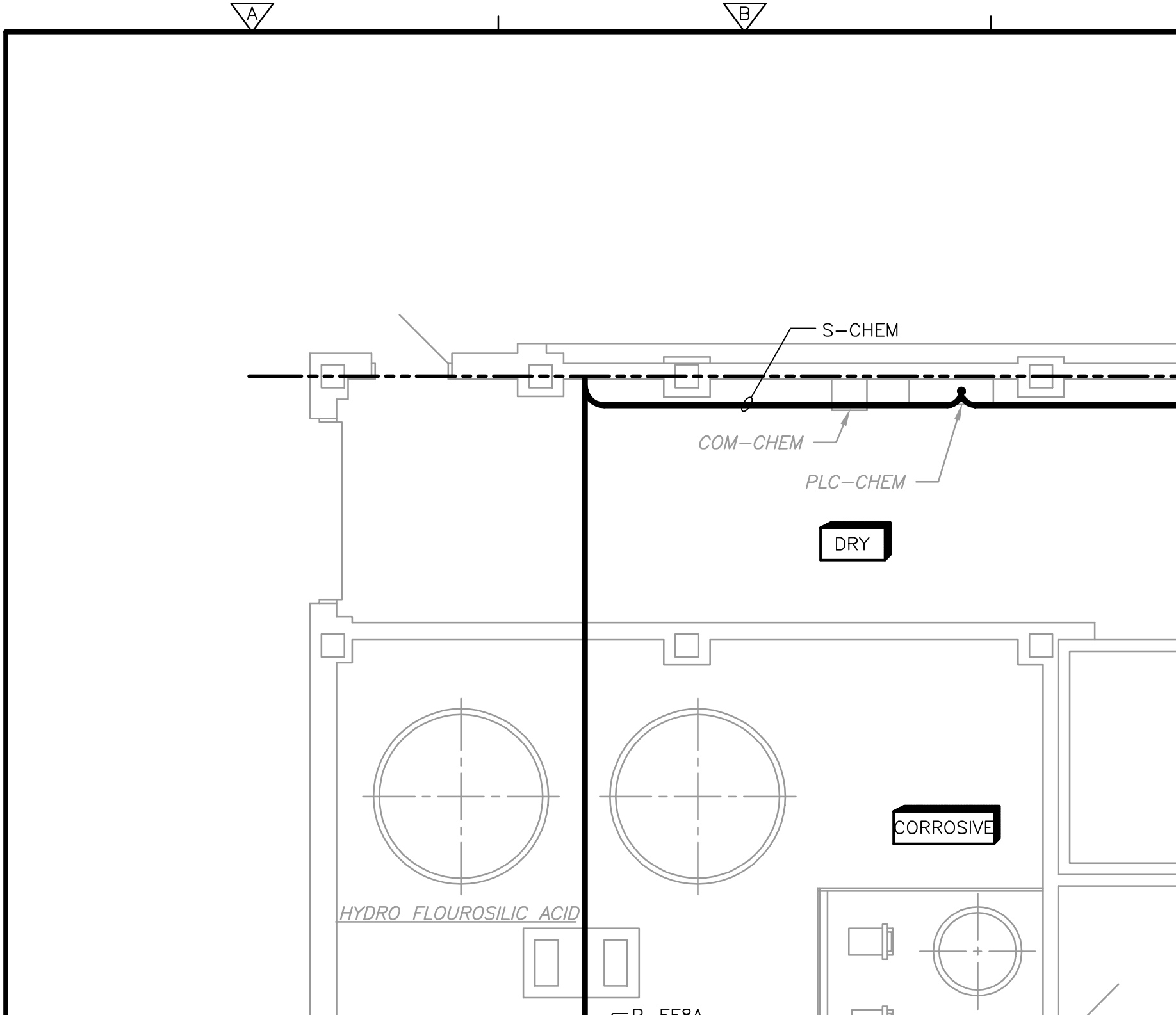
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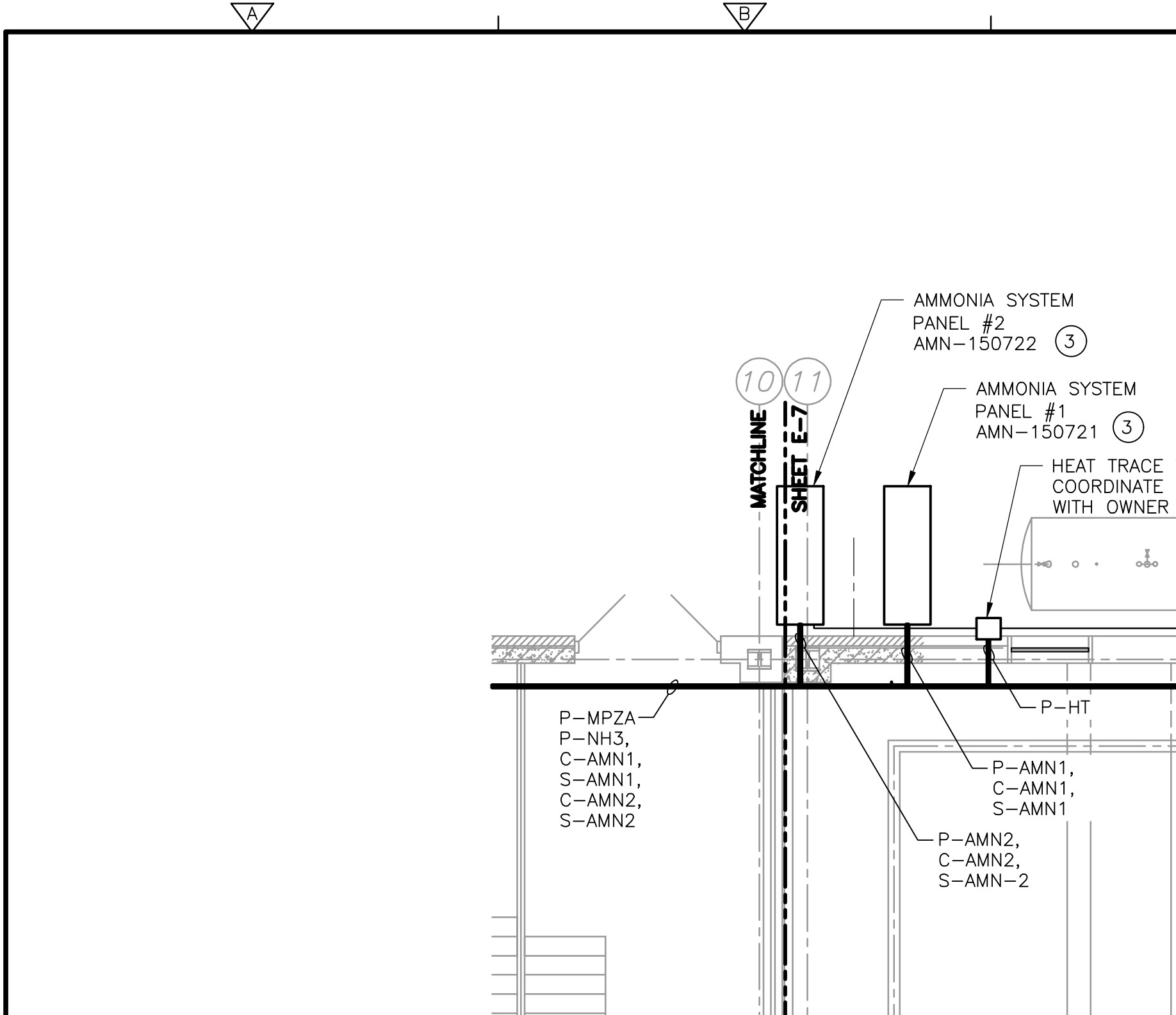
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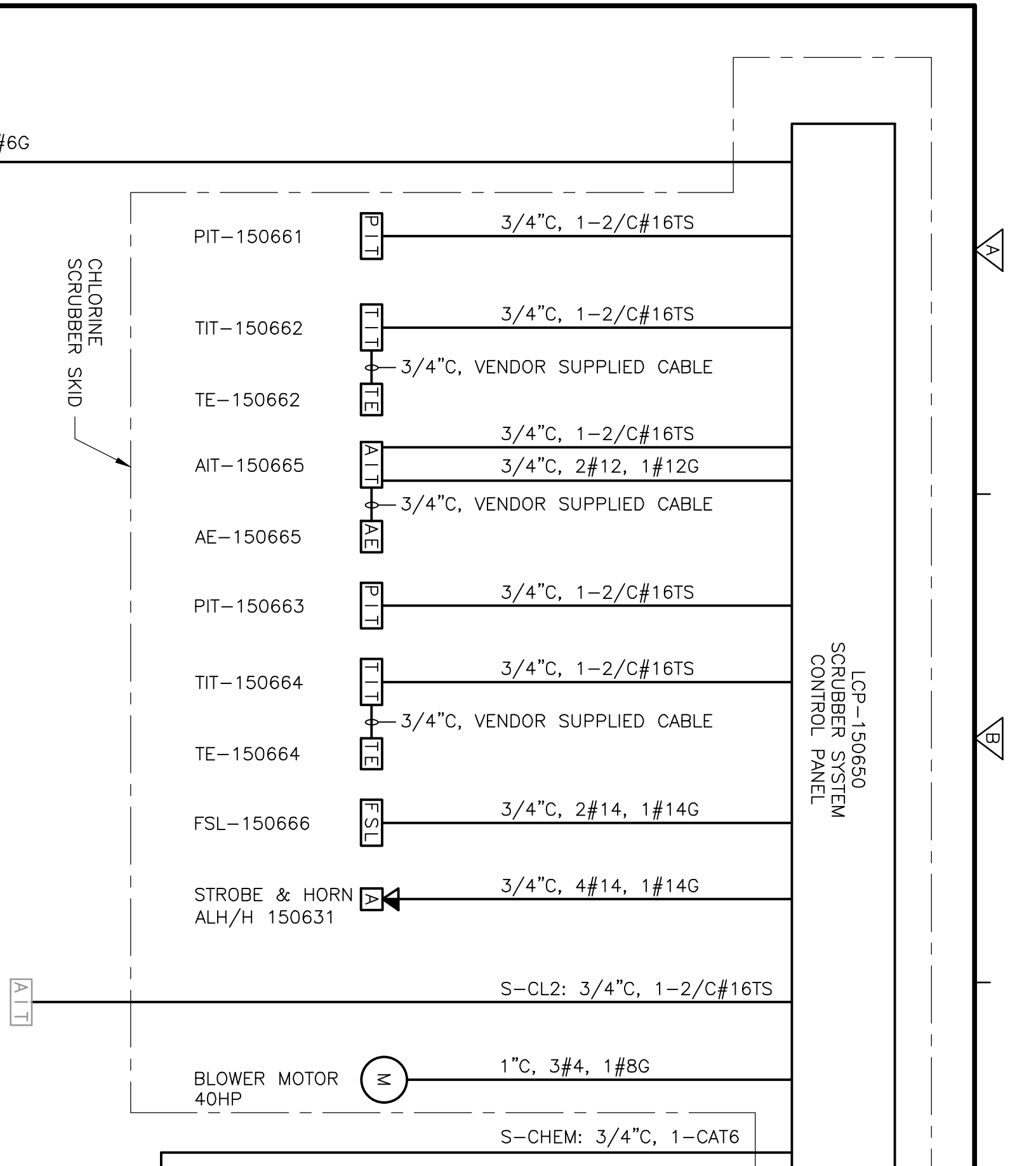
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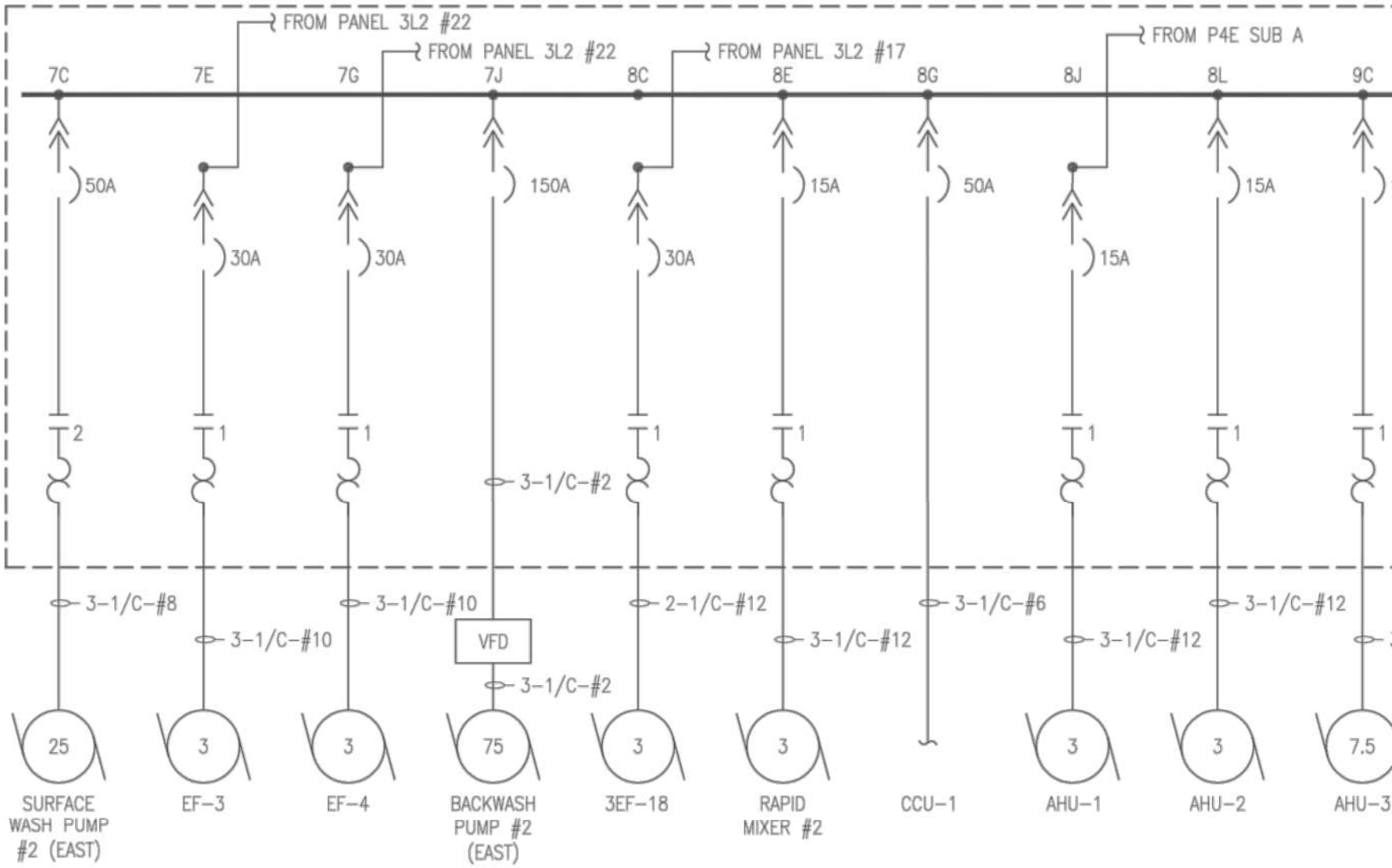
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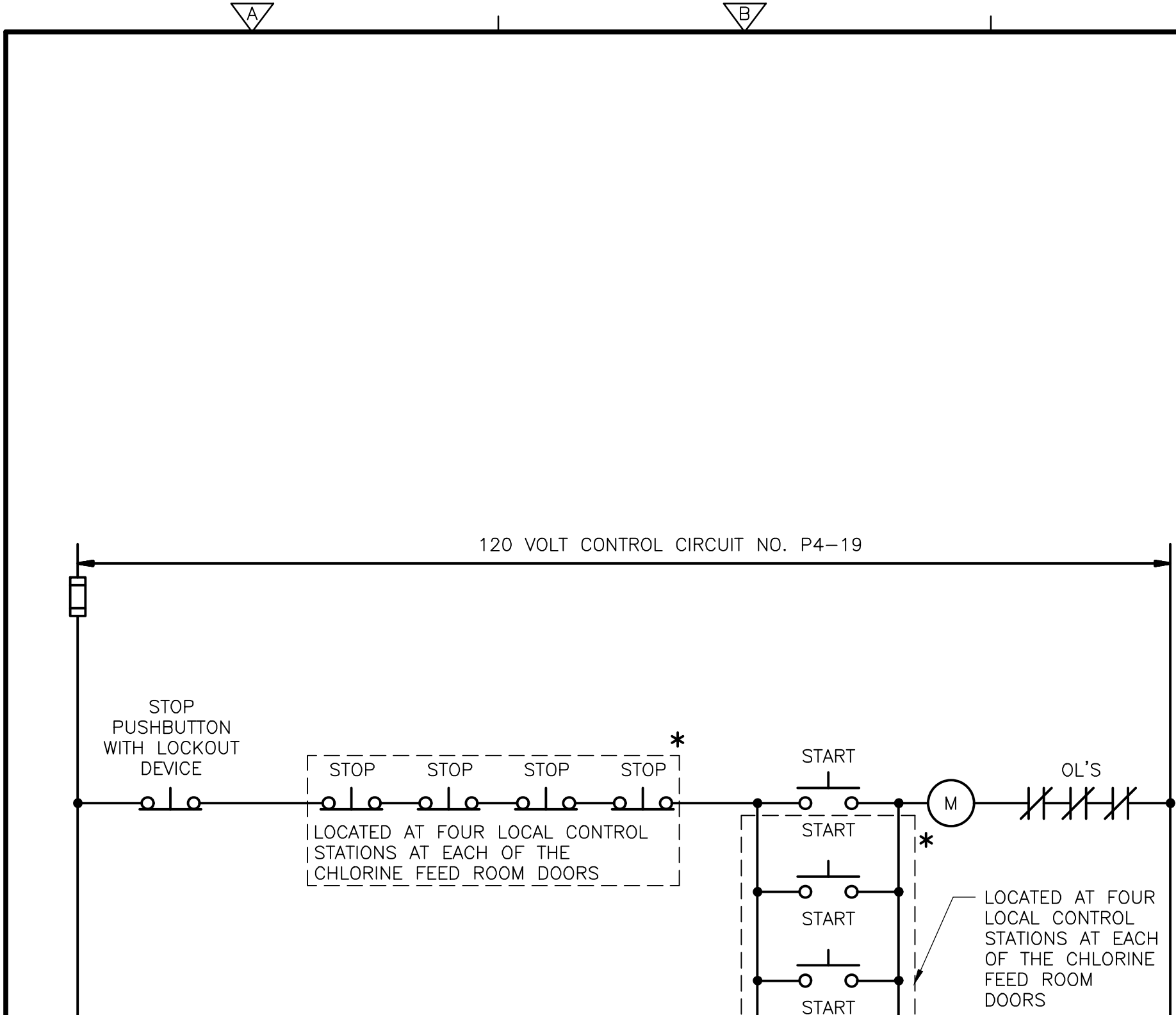
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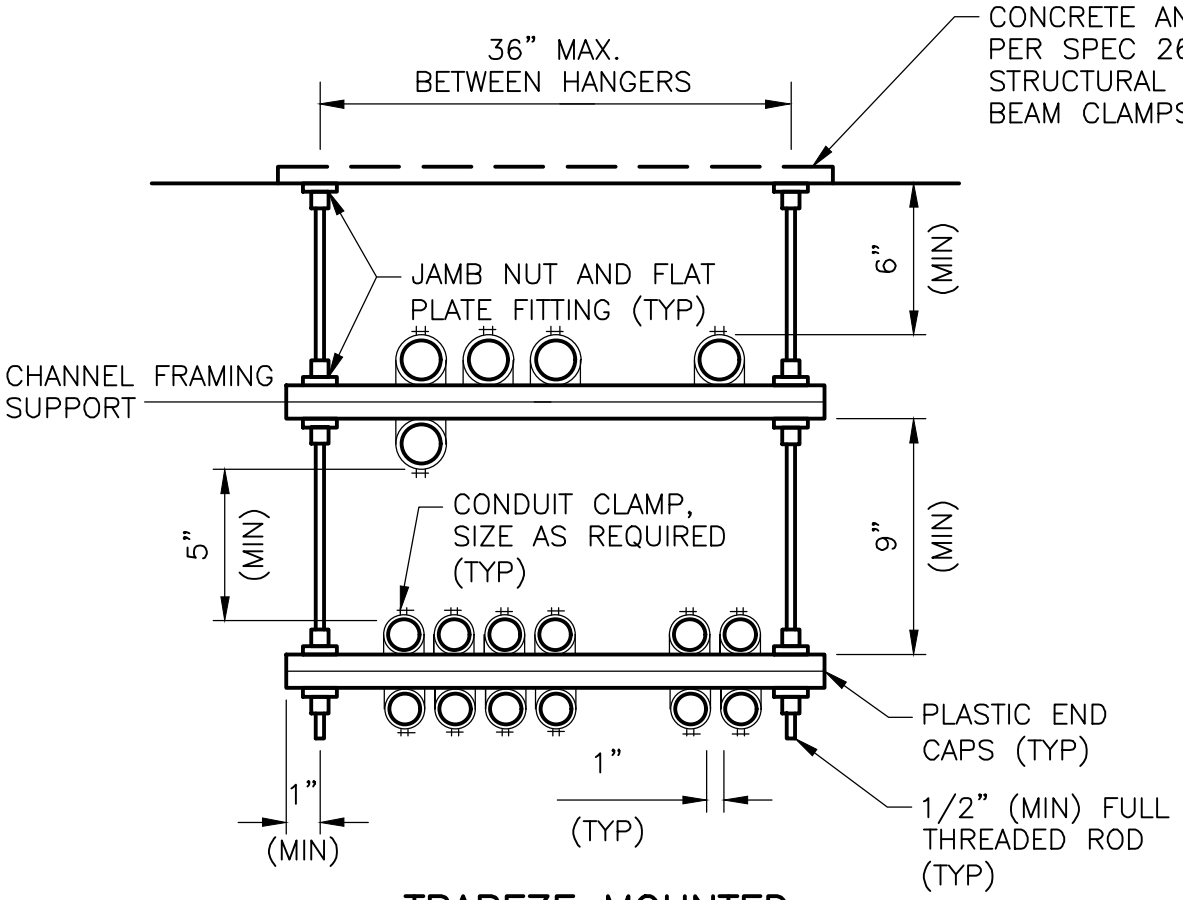
MOTOR CONTROL CENTER–MCC

ONE-LINE DIAG

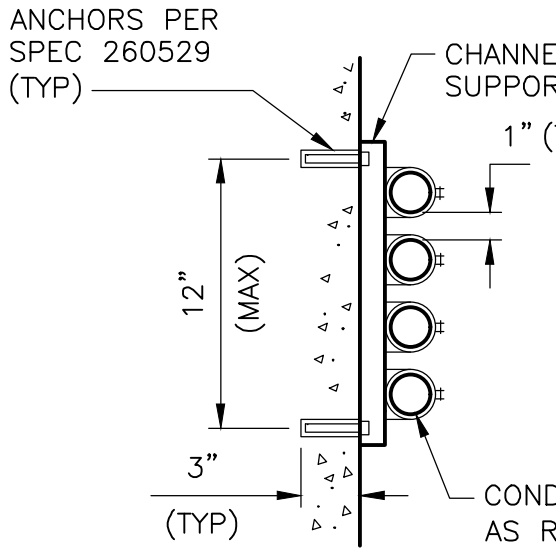
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TRAPEZE MOUNTED



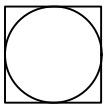
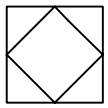
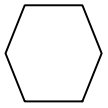
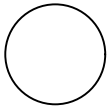
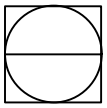
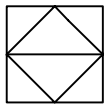
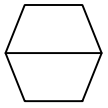
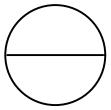
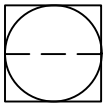
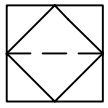
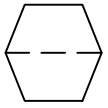
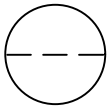
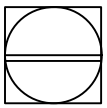
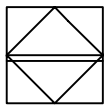
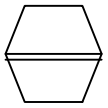
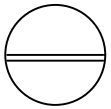
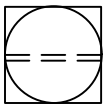
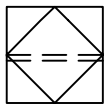
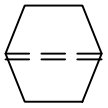
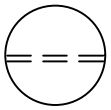
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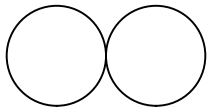
CEILING OR W

NOTE:

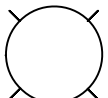
1. SEE SPECIFICATIONS FOR SUPPORT MATERIAL REQUIREMENTS.

GENERAL INSTRUMENT OR FUNCTION SYMBOLS

SHARED DISPLAY/ SHARED CONTROL				
PRIMARY CHOICE	SECONDARY CHOICE	COMPUTER SOFTWARE	DISCRETE	LOCATION AND ACCESSIBILITY
				FIELD MOUNTED AND NORMALLY OPERATOR ACCESSIBLE
				PRIMARY CONTROL PANEL MOUNTED AND NORMALLY OPERATOR ACCESSIBLE
				PRIMARY CONTROL PANEL MOUNTED AND NOT NORMALLY OPERATOR ACCESSIBLE
				SECONDARY CONTROL PANEL MOUNTED AND NORMALLY OPERATOR ACCESSIBLE
				SECONDARY CONTROL PANEL MOUNTED AND NOT NORMALLY OPERATOR ACCESSIBLE



INSTRUMENTS SHARING COMMON HOUSING



PILOT LIGHT

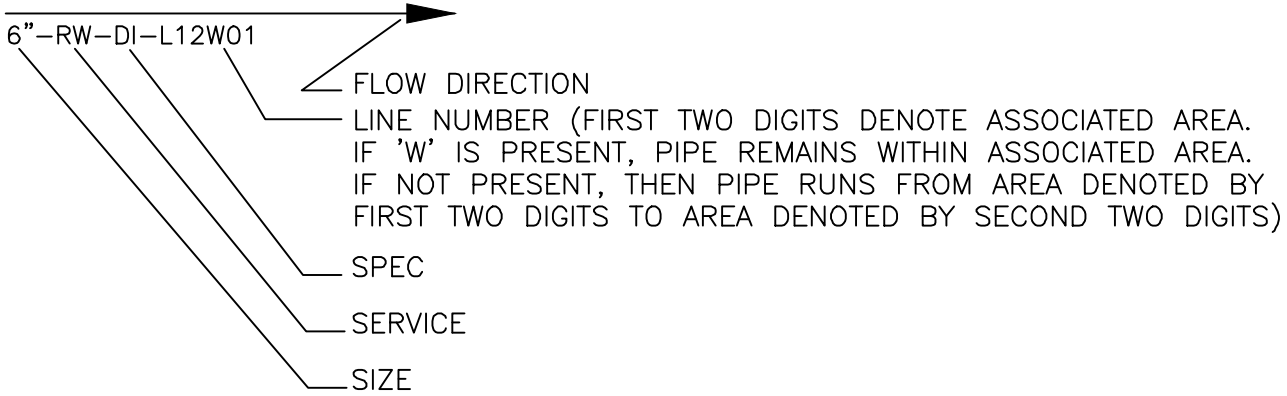
	FI
	COLUMN 1
	MEASURED/INITIAT VARIABLE
A	ANALYSIS
B	BURNER, COMBUST
C	USER'S CHOICE
D	USER'S CHOICE
E	VOLTAGE
F	FLOW, FLOW RATE
G	USER'S CHOICE
H	HAND
I	CURRENT
J	POWER
K	TIME, SCHEDULE
L	LEVEL
M	MOISTURE
N	USER'S CHOICE
O	USER'S CHOICE
P	PRESSURE
Q	QUANTITY
R	RADIATION
S	SPEED, FREQUENC
T	TEMPERATURE
U	MULTIVARIABLE
V	VIBRATION, MECHANICAL, ANAL
W	WEIGHT, FORCE
X	UNCLASSIFIED (1)
Y	EVENT, STATE, PRESENCE
Z	POSITION, DIMENSI

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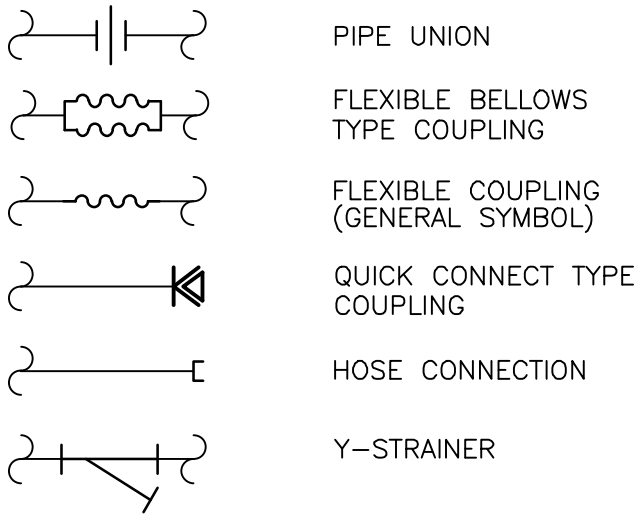
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A B

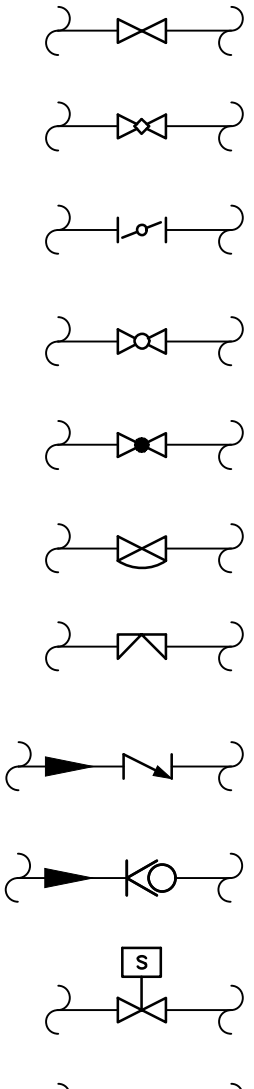
TYPICAL PIPE TAG NUMBERS & DESIGNATION



PIPE LINE SYMBOLS



VALVE



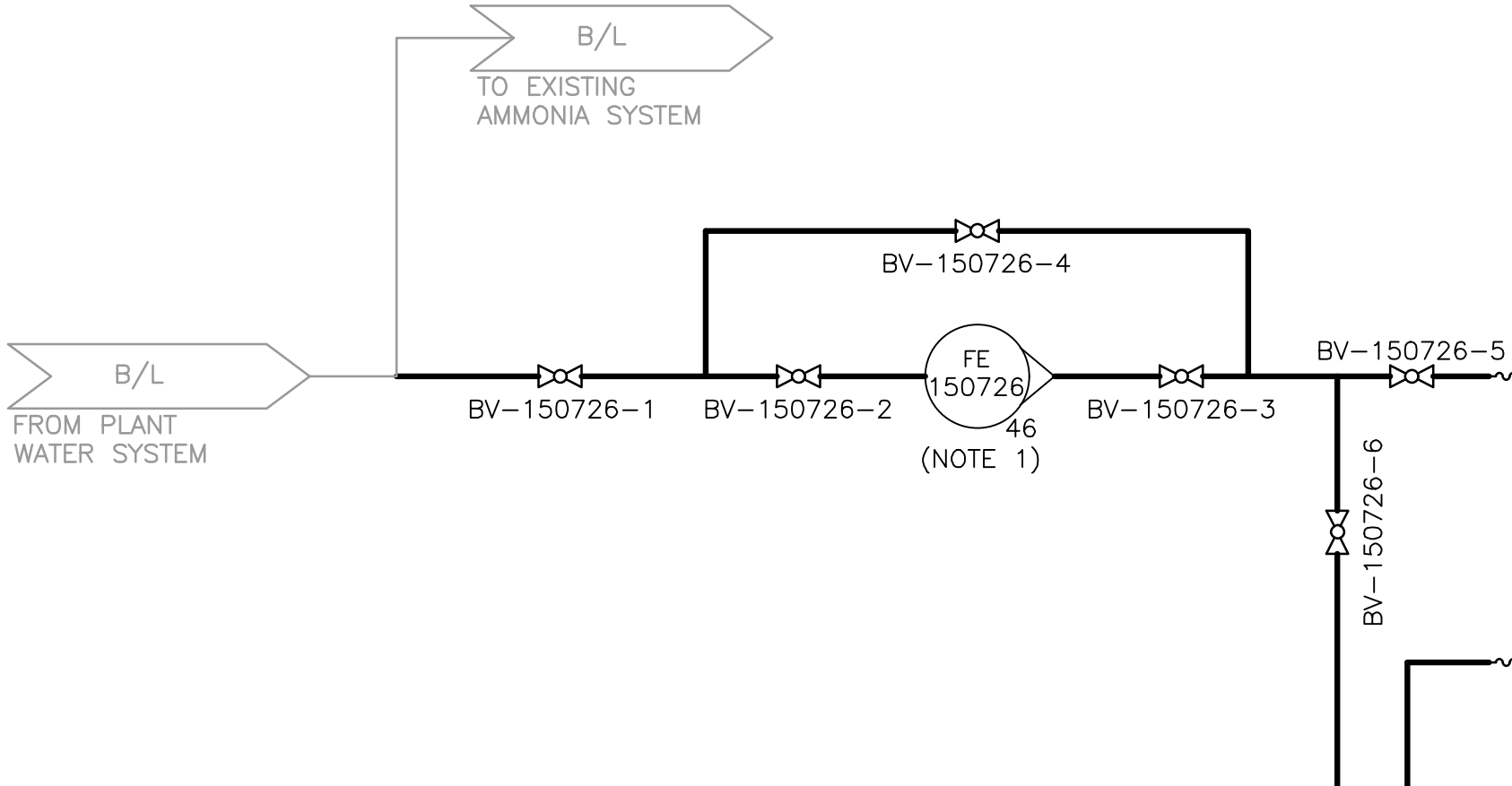
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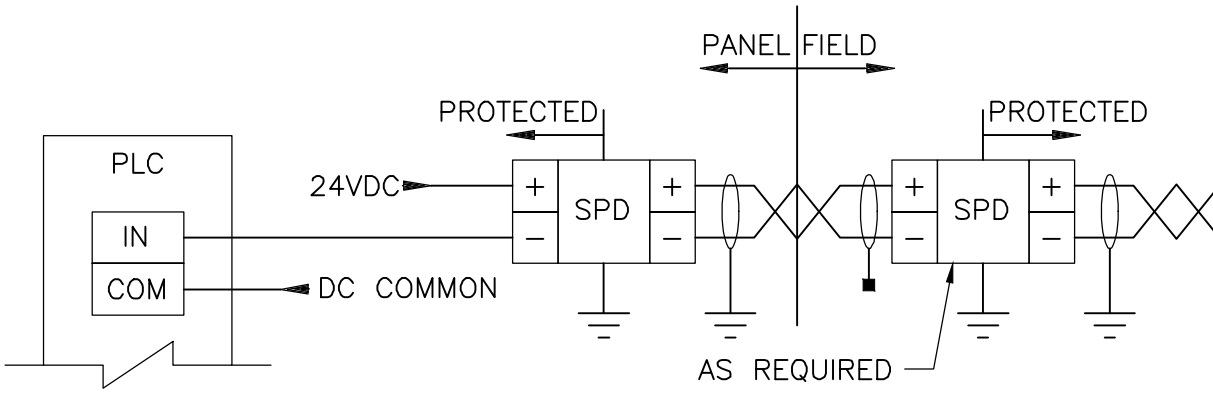
A

B

PLC–CHEM



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TYPICAL TRANSMITTER LOOP (LOOP POWERED: 2 WIRE)

DETAIL A

NTS

NOTES:

1. TERMINATE SPD
   DAISY CHAIN.
2. TERMINATE SHIE
   BUS/ GROUND.
3. TAPE BACK SHIE
4. WHERE SPD ARE
   SURGE PROTECT
   POSSIBLE.
5. INSTALL SPD IN
   ENVIRONMENT. S