CITY OF EVANSTON

SPECIFICATIONS AND BID DOCUMENTS
Construction Bid with Sub-contractors

BID NUMBER: 23-58

For

Service Center North Fuel Island Replacement
December, 21, 2023

BID DUE DATE:	**2:00 P.M., Tuesday, January 16, 2024**
VIRTUAL BID OPENING:	**2:15 P.M., Tuesday, January, 16, 2024** **Google Meet ID:** meet.google.com/erk-vjyw-pza **Phone Number:** 617-675-4444 **PIN:** 491 020 418 0044#
BID BOND:	**5% of Contract Amount**
PERFORMANCE/MATERIAL & LABOR PAYMENT BOND:	**100% of Contract Amount**
CONTRACT PERIOD:	**Substantial Completion: September 27, 2024** **Final Completion: October 25, 2024**

ELECTRONIC BID SUBMITTAL:
Bid responses will only be accepted electronically
via E-bidding through DemandStar (WWW.DEMANDSTAR.COM)
It is highly recommended that new DemandStar users complete the account setup process prior to project due date/time.

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***NOTE: AS ALTERNATE BID #1, THE SELECTED BIDDER MAY PROVIDE PRICING TO INCORPORATE THE REGULATIONS CONTAINED IN CITY OF EVANSTON ORDINANCE 60-O-14 AMENDMENTS TO THE LOCAL EMPLOYMENT PROGRAM (LEP)**

CITY OF EVANSTON
NOTICE TO BIDDERS

Bids will be received by the City's Purchasing Office until 2:00 P.M. local time **Tuesday, January 16, 2024** and will be publically read virtually via Google Meets at 2:15 P.M. Interested parties can use the following link: meet.google.com/erk-vjyw-pza or join by phone at 617-675-4444, PIN: 491 020 418 0044# to access the virtual bid opening. The City of Evanston no longer accepts hard copy paper submittals for any solicitation. Responses will only be accepted electronically via E-bidding through DemandStar (www.demandstar.com). Although registration is required, vendors can download solicitations and upload responses for free. Bids shall cover the following:

Service Center North Fuel Island Replacement
Bid Number: 23-58

Work on this project includes reconstruction of the north fuel island at the Evanston Service Center located at 2020 Asbury Avenue, Evanston, Illinois 60201.

The above item shall conform to the Invitation for Bids on file in the Purchasing Office. Parties interested in submitting a bid should contact the Purchasing Office to receive a copy of the bid or see the City's website at: www.cityofevanston.org/business/bids-proposals/ or DemandStar at: www.demandstar.com.

The City of Evanston (the City) in accordance with the laws of the State of Illinois, hereby notifies all Bidders that it will affirmatively ensure that the contract(s) entered into pursuant to this Notice will be awarded to the successful Bidders without discrimination on the ground of race, color, religion, sex, age, sexual orientation, marital status, disability, familial status or national origin. 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. The City of Evanston reserves the right to reject any or all submittals or to accept the submittal(s) deemed most advantageous to the City.

The Evanston City Council also reserves the right to award the contract to an Evanston firm if that firm's bid is within 5% of the low bid.

Each Bidder shall be required to submit with their bid a disclosure of ownership interest statement form in accordance with the provisions of City Code Section 1-18-1 *et seq*. Failure to submit such information will result in the disqualification of such bid.

Linda Thomas
Purchasing Specialist

INSTRUCTIONS TO BIDDERS/REQUIREMENTS FOR BIDDING
(CONTRACTS OVER $25,000)

1. ON-LINE NOTIFICATION OF SOLICITATIONS

The City is utilizing Demandstar.com (www.demandstar.com) for on-line notification purposes only for sealed bids when it is anticipated that the amount of the resulting contract will be in excess of its formal bid limit of $25,000, such as this requirement. Interested Bidders are required to submit a sealed bid to the City by the date/time indicated for this requirement on the forms provided by the City.

2. SUBMISSION OF BIDS

A. The City of Evanston no longer accepts hard copy paper submittals for any solicitation. Responses will only be accepted electronically via E-bidding through DemandStar (WWW.DEMANDSTAR.COM). Although registration is required, vendors can download solicitations and upload bid responses for free. **Please refer to attached DemandStar E-bidding documents.**

B. ANY BIDS RECEIVED AFTER THE TIME AND DATE SPECIFIED FOR THE RECEIPT OF BIDS WILL NOT BE ACCEPTED. It is the sole responsibility of the Bidder to insure that his or her bid is delivered by the stated bid opening time. THE CITY IS NOT RESPONSIBLE FOR INCOMPLETE UPLOADED SUBMITTALS.

C. Bids will be opened on the date and time stated.

D. Any Bidder may withdraw his or her bid by letter or with proper identification by personally securing his or her bid at any time prior to the stated bid opening time. No telephone request for withdrawal of bids will be honored.

3. PREPARATION OF BIDS

The Bidder must prepare the bid on the attached bid forms. Unless otherwise stated, all blank spaces on the bid form or pages must be filled in. Either a unit price, lump sum price, or a "no-bid", as the case may be, must be stated for each and every item and must be either typed in or written in ink.

4. SIGNING OF BIDS

A. Bids which are signed for a partnership should be signed in the firm's name by all partners or in the firm's name by Attorney-in-Fact. If signed by Attorney-in-Fact, there should be attached to the bid a Power of Attorney evidencing authority to sign the bid, dated the same date as the bid and executed by all partners of the firm.

B. Bids which are signed for a corporation should have the correct corporate name thereon and signature of an authorized officer of the corporation manually written below the corporate name following words "By: "_____" title of office held by the person signing for corporation, which shall appear below signature of an officer.

C. Bids which are signed by an individual doing business under a fictitious name should be signed in the name of the individual "doing business as. _____."

D. The name of each person signing the bid shall be typed or printed below his or her signature.

5. CONSIDERATION OF BIDS

The Purchasing Specialist shall represent and act for the City in all matters pertaining to this bid and the contract in conjunction therewith.

6. WITHDRAWAL OF BIDS

Bidders may withdraw or cancel their bids at any time prior to the advertised bid opening time. After the bid opening time, no bid shall be withdrawn or canceled for a period of sixty (60) calendar days. When contract approval is required by another agency, such as the Federal Government or the State of Illinois, no bid shall be withdrawn or canceled for a period of ninety (90) calendar days.

7. ERRORS IN BIDS

Bidders are cautioned to verify their bids before submission. Negligence on the part of the respondent in preparing the bid confers no right for withdrawal or modification of the bid after it has been opened. In case of error in the extension of prices in the bid, unit prices will govern.

8. ADDENDA

A. Any and all changes to the specifications/plans are valid only if they are included by written addendum to all Bidders. Each Bidder must acknowledge receipt of any addenda by indicating on the Bid form. Each Bidder, by acknowledging receipt of any addenda, is responsible for the contents of the addenda and any changes to the bid therein. Failure to acknowledge any addenda may cause the bid to be rejected.

B. Addenda information is available over the internet at: City of Evanston Notices to Bidders or www.demandstar.com, or by contacting the Purchasing Office.

9. RESERVED RIGHTS

The City of Evanston reserves the right at any time and for any reason to cancel his or her solicitation, to accept or reject any or all bids or any portion thereof, or to accept an alternate response. The City reserves the right to waive any immaterial defect in any response. The City may seek clarification from any respondent at any time, and failure to respond within a reasonable time period, or as otherwise directed, will be cause for rejection.

10. AWARD

It is the intent of the City to award a contract to the lowest responsible Bidder meeting specifications. The City reserves the right to determine the lowest responsible Bidder on the basis of an individual item, groups of items, or in any

way determined to be in the best interest of the City. Award will be based on the following factors (where applicable): (a) adherence to all conditions and requirements of the bid specifications; (b) price; (c) qualifications of the Bidder, including past performance, financial responsibility, general reputation, experience, service capabilities, and facilities; (d) delivery or completion date; (e) product appearance, workmanship, finish, taste, feel, overall quality, and results of product testing; (f) maintenance costs and warranty provisions; and (g) repurchase or residual value.

11. INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

Bidder's shall promptly notify the City of any ambiguity, inconsistency, or error that they discover upon examination of the bidding documents. Interpretations, corrections, and changes will be made by addendum. Each Bidder shall ascertain prior to submitting a bid that all addenda have been received and are acknowledged in the bid.

12. INCONSISTENCIES AND OMISSIONS

These specifications and the accompanying plans, if any, are intended to include all information necessary for the work contemplated. If, by inadvertence or otherwise, the plans or specifications omit some information necessary for that purpose, the contractor shall, nevertheless, be required to perform such work at no additional cost to the City so that the project may be completed according to the true intent and purpose of the plans and specifications.

13. CONDITIONS

Bidders are advised to become familiar with all conditions, instructions, and specifications governing his or her bid. Once the award has been made, failure to have read all the conditions, instructions and specifications of this contract shall not permit the Bidder to amend contract or to request additional compensation.

14. VERIFICATIONS OF DATA

A. It is understood and agreed that the unit quantities given in these specifications are approximate only, and the contractor shall verify these quantities before bidding as no claim shall be made against the City on, or account of, any excess or deficiency in the same.

B. The contractor shall have visited the premises and determined for itself, by actual observation, boring, test holes, or other means, the nature of all soil and water conditions (both above and below ground in the line of work) that may be encountered in all construction work under this contract. The cost of all such inspection, borings, etc. shall be borne by the contractor, and no allowance will be made for the failure of the contractor to estimate correctly the difficulties attending the execution of the work.

15. SPECIFICATIONS

Reference to brand names and numbers is meant to be descriptive, not restrictive, unless otherwise specified. Bids on equivalent items will be considered, provided

the Bidder clearly states exactly what is proposed to be furnished, including complete specifications. Unless the Bidder specifies otherwise, it is understood the Bidder is offering a referenced brand item as specified or is bidding as specified when no brand is referenced, and does not propose to furnish an "equal." The City reserves the right to determine whether a substitute offer is equivalent to, and meets the standard of quality indicated by the brand name and number.

16. SAMPLES

When samples of items are called for by the specifications, samples must be furnished free of expense, and if not destroyed in the evaluation process will be returned at the Bidder's expense upon request. Request for the return of samples must accompany the sample and must include a UPS/Fed-Ex Pickup Slip, postage, or other acceptable mode of return. Individual samples must be labeled with Bidder's name, invitation number, item reference, manufacturer's brand name and number.

17. REGULATORY COMPLIANCE

Each Bidder represents and warrants that the goods or services furnished hereunder (including all labels, packages and containers for said goods) comply with all applicable standards, rules and regulations in effect under the requirements of all Federal, State, and local laws, rules and regulations as applicable, including the Occupational Safety and Health Act as amended, with respect to design, construction, manufacture, or use for their intended purpose of said goods or services. Each Bidder must furnish a "Material Safety Data Sheet" in compliance with the Illinois Toxic Substances Disclosure to Employees Act when required.

18. PRICING

The price quoted for each item is the full purchase price, including delivery to destination, and includes all transportation and handling charges, materials or service costs, patent royalties, and all other overhead charges of every kind and nature. Unless otherwise specified, prices shall remain firm for the contract period.

19. DISCOUNTS

Prices quoted must be net after deducting all trade and quantity discounts. Where cash discounts for prompt payment are offered, the discount period shall begin with the date of receipt of a correct invoice or receipt or final acceptance of goods, whichever is later.

20. INSPECTION

Materials or equipment purchased are subject to inspection and approval at the City's destination. The City reserves the right to reject and refuse acceptance of items which are not in accordance with the instructions, specifications, drawings or data of Seller's warranty (express or implied). Rejected materials or equipment shall be removed by, or at the expense of, the Seller promptly after rejection.

21. BIDS AND PLAN DEPOSITS

A. When required on the cover sheet, all bids shall be accompanied by a bid deposit in the amount specified. Bid deposits shall be in the form of cash, a certified check, or cashier's check drawn on a responsible bank doing business in the United States and shall be made payable to the City of Evanston. Bid Bonds are also acceptable. All bids not accompanied by a bid deposit, when required, will be rejected.

B. The City will return the bid deposits of all but the 3 lowest qualified Bidders, whose deposit will be held until contract award or at the expiration of the sixty-day or ninety-day period for bid award.

C. The bid deposit of the successful Bidder will be retained until contract documents have been executed and the Contractor has submitted all the required information. Failure to comply with the terms of this specification may be cause for forfeiture of said deposit.

D. When required, plan deposits will be refunded should the plans be returned in good condition within 10 days of the bid opening.

22. DISPUTES

Any dispute concerning a question of fact arising under this bid shall be decided by the Purchasing Specialist, who shall issue a written decision to the Bidder. The decision of the Purchasing Specialist shall be final and binding.

23. CATALOGS

Each Bidder shall submit, when requested by the Purchasing Specialist, catalogs, descriptive literature, and detailed drawings, fully detailing features, designs, construction, appointments, finishes and the like not covered in the specifications, necessary to fully describe the material or work proposed to be furnished.

24. TAXES

A. Federal Excise Tax does not apply to materials purchased by the City of Evanston by virtue of Exemption Certificate No. A-208762, Illinois Retailers' Occupation Tax, Use Tax, and Municipal Retailers' Occupation Tax do not apply to materials or services purchased by the City of Evanston by virtue of Statute.

B. The City of Evanston is exempt from Illinois Sales Tax by virtue of Exemption Identification number E9998-1750.

C. The City’s federal tax ID number is 36-6005870.

25. PERMITS & FEES

All Bidders awarded a contract must secure and pay for any licenses required by the City of Evanston. Necessary building permits will be required, but all permit fees will be waived and moneys for same must not be included in any bid.

26. ROYALTIES & PATENTS

Seller must pay all royalties and license fees. Seller must defend all suits or

claims for infringement of any patent, copyright or trademark rights, and must hold the City harmless from loss on account thereof.

27. LOCAL PREFERENCE POLICY

The Evanston City Council reserves the right to award the contract to an Evanston firm if the firm's bid is within five (5%) percent of the low bid of a non-Evanston firm.

28. POWER OF ATTORNEY

An Attorney-In-Fact, who signs any and all of the bond or contract bonds submitted with this bid, must file with each bond a certified and effectively dated copy of their Power of Attorney. These dates should be the same or after the date of the contract.

29. WARRANTY

A. The contractor warrants that all goods and services furnished to the City shall be in accordance with specifications and free from any defects of workmanship and materials: that goods furnished to the City shall be merchantable and fit for the City's described purposes, and that no governmental law, regulation, order, or rule has been violated in the manufacture or sale of such goods.

B. The contractor warrants all equipment furnished to be in acceptable condition, and to operate satisfactorily for a period of one (1) year from delivery of, or the completion of installation, whichever is latest, unless stated otherwise in the specifications, and that if a defect in workmanship and/or quality of materials are evidenced in this period, the Seller shall remit full credit, replace, or repair at City's discretion immediately, such equipment and/or parts that are defective at no additional cost to the City.

C. The contractor warrants to the City that each item furnished hereunder, and any component part thereof, will be new and in conformity with the specifications in all respects, unless otherwise specified, and is of the best quality of its respective kind, free from faulty workmanship, materials, or design, and installed sufficiently to fulfill any operating conditions specified by the City.

D. The contractor shall repair or replace any item or component part thereof found not to be in conformity with this paragraph provided the City notified the Seller of such nonconformity within one (1) year after initial use or within eighteen (18) months after delivery, whichever occurs first. In the event Seller fails to proceed diligently to so replace or repair within a reasonable time after receipt of such notice, the City may undertake or complete such replacement or repair for Seller's account, and the seller will be responsible for any additional costs. Acceptance shall not relieve the seller of its responsibility.

30. INCURRED COSTS

The City will not be liable for any costs incurred by Bidders in replying to this

invitation for bids.

31. VARIANCES

Each Bidder must state or list by reference any variations to specifications, terms and/or conditions set forth herein with its bid.

32. INDEMNIFICATION

A. The awarded Bidder/Contractor shall defend, indemnify and hold harmless the City and its officers, elected and appointed officials, agents, and employees from any and all liability, losses, or damages as a result of claims, demands, suits, actions, or proceedings of any kind or nature, including but not limited to costs, and fees, including attorney's fees, judgments or settlements, resulting from or arising out of any negligent or willful act or omission on the part of the Contractor or Contractor's sub-contractors, employees, agents or sub-contractors during the performance of this Agreement. Such indemnification shall not be limited by reason of the enumeration of any insurance coverage herein provided. This provision shall survive completion, expiration, or termination of this Agreement.

B. Nothing contained herein shall be construed as prohibiting the City, or its officers, agents, or employees, from defending through the selection and use of their own agents, attorneys, and experts, any claims, actions or suits brought against them. The Contractor shall be liable for the reasonable costs, fees, and expenses incurred in the defense of any such claims, actions, or suits. Nothing herein shall be construed as a limitation or waiver of defenses available to the City and employees and agents, including but not limited to the Illinois Local Governmental and Governmental Employees Tort Immunity Act, 745 ILCS 10/1-101 *et seq.*

C. At the City Corporation Counsel's option, Contractor must defend all suits brought upon all such Losses and must pay all costs and expenses incidental to them, but the City has the right, at its option, to participate, at its own cost, in the defense of any suit, without relieving Contractor of any of its obligations under this Agreement. Any settlement of any claim or suit related to this Project by Contractor must be made only with the prior written consent of the City Corporation Counsel, if the settlement requires any action on the part of the City.

D. To the extent permissible by law, Contractor waives any limits to the amount of its obligations to indemnify, defend, or contribute to any sums due under any Losses, including any claim by any employee of Contractor that may be subject to the Illinois Compensation Act, 820 ILCS 305/1 *et seq.* or any other related law or judicial decision, including but not limited to, *Kotecki v. Cyclops Welding Corporation,* 146 Ill. 2d 155 (1991). The City, however, does not waive any limitations it may have on its liability under the Illinois Workers Compensation Act, the Illinois Pension Code or any other statute.

E. The Contractor shall be responsible for any losses and costs to repair or remedy work performed under this Agreement resulting from or arising out of any act or

omission, neglect, or misconduct in the performance of its Work or its sub-contractors' work. Acceptance of the work by the City will not relieve the Contractor of the responsibility for subsequent correction of any such error, omissions and/or negligent acts or of its liability for loss or damage resulting therefrom.

F. All provisions of this Section 32 shall survive completion, expiration, or termination of this Agreement.

33. DEFAULT

Time is of the essence as to the awarded contract and, of delivery or acceptable items or rending of services is not completed by the time promised, the City reserves the right, without liability, in addition to its other rights and remedies, to terminate the contract by notice effective when received by Seller, as to stated items not yet shipped or services not yet rendered and to purchase substitute items or services elsewhere and charge the Seller with all losses incurred. The City shall be entitled to recover its attorney's fees and expenses in any successful action by the City to enforce this contract.

34. GOVERNING LAW

This contract shall be governed by and construed according to the laws of the State of Illinois. In the event of litigation, the venue will be Cook County, Illinois.

35. EQUAL EMPLOYMENT OPPORTUNITY

A. In the event of the contractor's noncompliance with any provision of the Illinois Human Rights Act or Section 1-12-5 of the Evanston City Code, the contractor may be declared non-responsible and therefore ineligible for future contracts or sub-contracts with the City of Evanston, 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 or regulation.

B. During the performance of this contract, the contractor agrees as follows:

1. That it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin or ancestry, or age or physical or mental handicap that does not impair ability to work, 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 underutilization. Contractor shall comply with all requirements of City of Evanston Code Section 1-12-5.

2. 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, sex, national origin or ancestry.

3. That, if it hires additional employees in order to perform this contract, or any

portion hereof, it will determine that availability (in accordance with the Fair Employment Commission's Rules and Regulations for Public Contracts) 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.

4. 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 contractor's obligations under the Illinois Fair Employment Practices Act and the Fair Employment Practices Commission's Rules and Regulations for Public Contracts. If any such labor organization or representative fails or refuses to cooperate with the contractor in its efforts to comply with such Act and Rules and Regulations, the contractor will promptly so notify the Illinois Fair Employment Practices Commission and the contracting agency and will recruit employees from other sources when necessary to fulfill its obligations hereunder.

5. That it will submit reports as required by the Illinois Fair Employment Practices Commission's Rules and Regulations for Public Contracts, furnish all relevant information as may from time to time be requested by the Fair Employment Practices Commission or the contracting agency, and in all respects comply with the Illinois Fair Employment Practices Commission's Rules and regulations for Public Contracts.

6. That it will permit access to all relevant books, records, accounts and work sites by personnel of the contracting agency, the City Manager, the Commission and the Illinois Fair Employment Practices Commission for purposes of investigation to ascertain compliance with the Illinois Fair Employment Practices Act and the Fair Employment Practices Act and the Fair Employment Practices Commission's Rules and Regulations for Public Contract.

7. That it will include verbatim or by reference the provisions of subsections (A) through (G) of this clause in every performance sub-contract as defined in Section 2.10(b) of the Fair Employment Practices Commission's Rules and Regulations for Public Contracts so that such provisions will be binding upon every such sub-contractor; and that it will also include the provisions of subsections (A), (E), (F), and (G) in every supply sub-contract as defined in Section 2.10(a) of the Fair Employment Practices Commission's Rules and Regulations for Public Contracts so that such provisions will be binding upon every such sub-contractor. In the same manner as with other provisions of this contract, the contractor will be liable for compliance with applicable provisions of this clause by all its sub-contractors; and further it will promptly notify the contracting agency and the Illinois Fair Employment Practices Commission in the event any sub-contractor fails or refuses to comply therewith. In addition,

no contractor will utilize any sub-contractor declared by the Fair Employment Practices Commission to be non-responsible and therefore ineligible for contracts or sub-contracts with the State of Illinois or any of its political subdivisions or municipal corporations.

36. M/W/D/EBE GOAL

The City of Evanston has a goal of awarding 25% of its contracts to Minority-Owned, Women-Owned, and Evanston-based businesses (M/W/D/EBEs). All Bidders must state the proposed involvement of M/W/D/EBEs in completing a portion of the services required by the City by completing the attached M/W/D/EBE forms. Any questions regarding M/W/D/EBE compliance should be submitted in writing to Tammi Nunez, Purchasing Manager at tnunez@cityofevanston.org.

37. ALTERNATE BID #1 LOCAL EMPLOYMENT PROGRAM

At their option, contractors may provide pricing in Alternate Bid #1 to comply with the City's Local Employment Program as detailed below.

In an effort to increase hiring of economically disadvantaged Evanston residents on certain City construction projects, the contractor shall comply with the provisions of the City of Evanston's Local Employment Program Ordinance (LEP) set forth in Section 1-17-1 (C) of the Evanston City Code. The intent of the LEP is to have Evanston residents employed at the construction site as laborers, apprentices and journeymen in such trades as electrical, HVAC, carpenters, masonry, concrete finishers, truck drivers and other construction occupations necessary for the project. Any questions regarding LEP compliance should be submitted in writing to Nathan Norman, Youth/Young Adult Program Supervisor at nnorman@cityofevanston.org or Tammi Nunez Purchasing Manager at tnunez@cityofevanston.org.

NOTE: CITY OF EVANSTON ORDINANCE 60-O-14 AMENDMENT LOCAL EMPLOYMENT PROGRAM (LEP) available on the City website at:
Ordinance 60-O-14 Amendment LEP

38. QUESTIONS

All questions related to this bid document should be submitted in writing to Linda Thomas, Purchasing Specialist at lithomas@cityofevanston.org with a copy to Stefanie Levine, Senior Project Manager, at slevine@cityofevanston.org. Only inquiries received a minimum of seven (7) working days prior to the date set for the opening of bids, will be given any consideration.

39. COORDINATION OF EXISTING SITE WITH DRAWINGS

A. Before submitting a bid, bidders shall carefully examine the drawings and specifications, visit the site, and fully inform themselves as to all conditions and limitations.

B. Should a bidder find discrepancies in, or omissions from the drawings or specifications, or should be in doubt as to their meaning, the bidder should at once

notify the Purchasing Specialist, who will issue necessary instructions to all bidders in the form of an addendum.

40. AFFIRMATIVE ACTION IN SUB-CONTRACTING (EXCERPT FROM RESOLUTION 59-R-73)

"Contractor agrees that he shall actively solicit bids for the sub-contracting of goods or services from qualified minority businesses. At the request of the City, Contractor shall furnish evidence of his compliance with this requirement of minority solicitation. Contractor further agrees to consider the grant of sub-contracts to said minority bidders on the basis of substantially equal bids in the light most favorable to said minority businesses. Contractor further affirms that in obtaining his performance and bid bonds, he will seek out and use companies who have records of, and/or who will make commitments to, the bonding of minority contractors on a rate basis comparable to their bonding of similar non-minority contractors. The contractor may be required to submit this evidence as part of the bid or subsequent to it."

41. COMPLIANCE WITH LAWS

A. The bidder shall at all times observe and comply with all laws, ordinances and regulations of the Federal, State, Local and City Governments, which may in any manner affect the preparation of bids or the performance of the contract.

42. QUALIFICATION OF BIDDERS

A. All bidders must be qualified in accordance with the instructions, procedures and methods set forth in this specification.

B. In awarding contract, City may take into consideration, skill, facilities, capacity, experience, ability, responsibility, previous work, financial standing of bidder, amount of work being carried on by bidder, quality and efficiency of construction equipment proposed to be furnished, period of time within which proposed equipment is furnished and delivered, necessity of prompt and efficient completion of work herein described. Inability of any bidder to meet requirements mentioned above may be cause for rejection of the bid. In addition, if the project covered by this contract is a minority set-aside project, the contractor's qualifications as a minority firm will determine the eligibility of the contractor to bid.

43. COMPETENCY OF BIDDER

A. No bid will be accepted from or contract awarded to any person, firm or corporation that is in arrears or is in default to the City of Evanston upon any debt or contract, or that is a defaulter, as surety or otherwise, upon any obligation to said City, or had failed to perform faithfully any previous contract with the City.

B. The bidder, if requested, must present within forty eight (48) hours evidence satisfactory to the Purchasing Manager of performance ability and possession of necessary facilities, pecuniary resources and adequate insurance to comply with the terms of these specifications and contract documents.

44. PREFERENCE TO CITIZENS

The Contractor shall abide by the Illinois Preference Act, 30 ILCS 570 et seq., which stipulates that whenever there is a period of excessive unemployment in Illinois, defined as any month immediately following two (2) consecutive months during which the level of unemployment in Illinois exceeds five percent (5%) as measured by the U.S. Bureau of Labor Statistics in its monthly publication of employment and unemployment figures, the Contractor shall employ only Illinois laborers unless otherwise exempted as so stated in the Act. ("Illinois laborer" means any person who has resided in Illinois for at least 30 days and intends to become or remain an Illinois resident) Other laborers may be used IF Illinois laborers are not available or are incapable of performing the particular type of work involved if so certified by the Contractor and approved by the project engineer.

GENERAL CONDITIONS

1. BASIS OF AWARD

The City of Evanston reserves the right to award a contract to a responsive and responsible Bidder(s) who submits the lowest total bid, or to reject any or all bids and bidding, when in its opinion the best interest of the City will be served by such action. The City reserves the right to consider the specified alternates in its evaluation of the bids.

2. BIDS

A. LUMP SUM BID

1. The bidder is to submit a lump sum bid for each bid line on the Bid Form which includes all costs incidental to performing the specified work. It is understood and agreed that the unit quantities given in the supporting pages are approximate only and the bidder shall verify these quantities before bidding as no claim shall be made against the City on account of any excess or deficiency in the same.

2. Unit prices given in the supporting pages shall be used by the City and the Contractor for any subsequent changes in the contract.

3. QUANTITIES

Any quantities shown on the Bid Form are estimated only for bid canvassing purposes, the City has made a good faith effort to estimate the quantity requirements for the Contract term. The City reserves the right to increase or decrease quantities ordered under this contract.

4. CONTRACT TERM

Bidder must fully complete the work within the period specified herein after award of the contract by the City.

5. NOTICE TO PROCEED/ PURCHASE ORDER/ CONTRACT

A. The City issued Purchase Order serves as the City official Notice to Proceed. No work will be allowed prior to Contractor receipt of the City issued Purchase Order.

B. Upon approval of the required bonds and insurance documents, the City will issue a Purchase Order to the Contractor for the contract amount. All Applications for Payment must reference the Purchase Order number.

C. When it is necessary to issue a Change Order that increases/decreases the contract amount, a Change Order form will be issued and a modified Purchase Order will be issued reflecting the revised contract amount.

D. When it is necessary to issue a Change Order that only increases/decreases the contract period, only a Change Order form will be issued establishing the revised

contract period.

E. Upon Award the contractor shall execute the Contractor Services Agreement.

6. PAYMENT

A. Progress payments will be made in accordance with "Applications for Payment" and "Project Closeout" sections of the specifications, less a 10% retainage for each payment, which will be held until final acceptance of the work by the City. Certification of each Application for Payment will be made by the City's representative.

B. All payments will be made in accordance with *Illinois Local Government Prompt Payment Act.*

7. DECISIONS TO WITHHOLD CERTIFICATION FOR PAYMENT

A. The City may not certify payment and may withhold payment in whole or in part, to the extent reasonably necessary to protect the City, if the quality of the work is not in accordance with the contract documents. If the City is unable to certify payment in the amount of the invoice, the City will promptly issue payment for the amount of the Work completed in accordance with the contract documents. The City may not certify payment due to any contractor negligence or contract non-compliance.
   a. Defective work not remedied
   b. Third party claims filed or reasonable evidence indicating probable filing of such claims
   c. Failure of Contractor to make payments properly to Sub-contractors for labor, materials or equipment
   d. Reasonable evidence that the work cannot be completed for the unpaid balance of the Contract Sum
   e. Damage to the City or another contractor
   f. Reasonable evidence that the work will not be completed within the Contract period and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay
   g. Persistent failure to carry out work in accordance with the Contract Documents.

8. CHANGES IN WORK

A. The City reserves the right to make changes in the plans and specifications by altering, adding to, or deducting from the work, without invalidating the contract. All such changes shall be executed under the conditions of the original contract, except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.

B. No change shall be made unless a written Change Order and/or modified Purchase Order is issued by the City stating that the City has authorized the change, and no claim for an addition to the contract shall be valid unless so ordered.

C. If such changes diminish the quantity of work to be done they shall not constitute a claim for damage or anticipated profits on the work, such increase shall be paid in one or more of the following ways:

1. by estimate and acceptance in lump sum

2. by unit prices named in the contract's bid form or subsequently agreed upon

9. DEDUCTION FOR UNCORRECTED WORK

If the City deems it expedient to correct work damaged or not done in accordance with the contract, the difference in value, together with a fair allowance for damage shall be deducted from the contract amount due. The value of such deduction shall be determined by the City.

10. CITY'S RIGHT TO TERMINATE CONTRACT

The City reserves the right, in addition to other rights to termination, to terminate the contracts in accordance with all provisions of the executed contract.

11. LIENS

A. Neither the final payment nor any part of any retained percentages, shall become due until the contractor, if required, delivers to the City, a complete release of all liens arising out of this contract, or receipts in full in lieu thereof and, if required in either case, an affidavit that so far as it has knowledge or information the releases and receipts include all the labor and material for which a lien could be filed. If any lien remains unsatisfied after all payments are made the contractor shall refund to the City all moneys that the latter may be compelled to pay in discharging such a lien, including all costs and attorney's fees.

12. SEPARATE CONTRACTS

A. The City reserves the right to let other contracts in connection with this work. The contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his or her work with theirs. If any part of the contractor's work depends on proper execution or results upon the work of any other contractor, the contractor shall inspect and promptly report to the City any defects in such work that render it unsuitable for such proper execution and results. His or her failure to so inspect and report shall constitute an acceptance of other contractor's work as fit and proper.

B. To insure the proper execution of his or her subsequent work, the contractor shall measure work already in place and shall at once report to the City any discrepancy between the executed work and the drawings which will affect his or her work.

13. PROTECTION & SAFEGUARDS

A. Unless otherwise specified, the contractor, as a part of this contract, shall provide, erect and maintain temporary roads, fences, bracing, lights, warning signs,

barricades, etc. necessary for the protection of the construction materials, adjacent property and the public.

B. The contractor shall contact all utilities which will be affected by its operations and notify the owners of the utilities of its operations and their limits within forty-eight (48) hours prior to beginning construction. The contractor shall be responsible for damage to utilities and shall, at his or her own expense, restore such property to a condition equal to that which existed before its work, as may be directed by the owners.

C. The contractor shall protect all work and unused materials of this contract from any and all damage and shall be solely responsible for the condition of such work and materials.

14. MATERIAL STORAGE

A. On-site areas may be designated for material/equipment storage. The contractor will assume all risk and liability associated with the storage of material/equipment at on-site locations.

15. CLEANING UP

A. The contractor shall at all time keep the premises free from accumulation of waste material or rubbish caused by its employees or work and at the completion of the work it shall remove all its rubbish, tools, and surplus materials from the premises, leaving the area in a neat and workmanlike condition. In case of dispute, the City may remove the rubbish and charge the cost to the contractor.

B. Contractor recognizes that proper cleanup and removal of construction debris is an important safety consideration. The Contractor shall be solely responsible for daily construction site/area cleanup and removal of all construction debris in accordance with City-approved disposal practices. Contractor shall be solely responsible for identifying and removing at its expense all hazardous material and waste which it uses and generates.

16. RESTORATION OF SITE

A. Prior to final payment, contractor shall fully restore all property disturbed or damaged during the course of this work. This includes, but is not limited to public property, (walks, curbs, roadways, trees, etc.) private property, and utilities. This shall also include removal of temporary facilities erected during the course of this contract and restoration of these areas.

B. All restoration work shall be subject to the approval of the City and shall restore the property to a condition at least equal to that existing prior to the start of this contract.

C. All restoration work of property damaged by contractor shall be accomplished at the sole expense of the contractor.

17. PREVAILING WAGE

A. Prospective Bidders shall thoroughly familiarize themselves with the provisions of the above-mentioned Act and shall prepare any and all bids/bids in strict compliance therewith.

B. **Effective September 1st - All work performed on new and existing projects must be submitted to** Illinois Department of Labor **through the certified transcript of payroll portal.** You may access the portal here: Certified Transcript of Payroll Portal

All contractors and sub-contractors on public works projects ***must submit and upload certified payrolls*** on a monthly basis to the **IDOL** online portal, provide a pdf copy to the City's project manager and business work force development coordinator, along with a statement affirming that such records are true and accurate, that the wages paid to each worker are not less than the required prevailing rate and that the contractor is aware that filing records her or she knows to be false is a Class B misdemeanor.

C. The certified payroll record 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 pay period, number of hours worked each day, and starting and ending time of work each day. These certified payroll records are considered public records and public bodies must make these records available to the public under the Freedom of Information 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.

D. All certified payrolls shall be submitted in electronic format, preferably a PDF file.

E. As a condition of receiving payment, Contractor must (i) be in compliance with the Agreement, (ii) pay its employees prevailing wages when required by law (Examples of prevailing wage categories include public works, printing, janitorial, window washing, building and grounds services, site technician services, natural resource services, security guard and food services). Contractor is responsible for contacting the Illinois Dept. of Labor 217-782-1710; https://www2.illinois.gov/idol/Laws-Rules/CONMED/Pages/prevailing-wage-act.aspx compliance with prevailing wage requirements), (iii) pay its suppliers and sub-contractors according to the terms of their respective contracts, and (iv) provide lien waivers to the City upon request.

18. CONTRACTOR REQUIREMENTS

A. The Contractor shall abide by and comply with all local, State and federal laws and regulations relating to contracts involving public funds and the development/construction of public works, buildings, or facilities. The scale of wages to be paid shall be obtained from Illinois Department of Labor and posted by the Contractor in a prominent and accessible place at the project work site.

B. The Contractor certifies it has not been barred from being awarded a contract with a unit of State or local government as a result of bid rigging or bid rotating or any similar offense (720 ILCS 5/33 E-3, E-4).

C. The Contractor certifies, pursuant to the Illinois Human Rights Act (775 ILCS 5/2-105), that it has a written sexual harassment policy that includes, at a minimum, the following information: (1) the illegality of sexual harassment, (2) the definition of sexual harassment under State law, (3) a description of sexual harassment utilizing examples, (4) the Contractor's internal complaint process including penalties, (5) legal recourse, investigation and complaint process available through the Illinois Department of Human Rights and the Human Rights Commission and directions on how to contact both; and (6) protection against retaliation as provided by Section 6-101 of the Illinois Human Rights Act.

D. The Contractor shall abide by the "Illinois Preference Act" which stipulates that whenever there is a period of excessive unemployment in Illinois, defined as any month immediately following two (2) consecutive months during which the level of unemployment in Illinois exceeds five percent (5%) as measured by the U.S. Bureau of Labor Statistics in its monthly publication of employment and unemployment figures, the Contractor shall employ only Illinois laborers unless otherwise exempted as so stated in the Act. ("Illinois laborer" means any person who has resided in Illinois for at least 30 days and intends to become or remain an Illinois resident) Other laborers may be used IF Illinois laborers are not available or are incapable of performing the particular type of work involved if so certified by the Contractor and approved by the project engineer.

19. SUB-CONTRACTORS

A. The term "sub-contract" means any agreement, arrangement or understanding, written or otherwise between a Contractor and any person (in which the parties do not stand in the relationship of an employer or an employee) for the furnishing of supplies or services or for the use of real or personal property, including lease arrangements, which, in whole or in part, is utilized in the performance of any one or more Contracts under which any portion of the Contractor's obligation under any one or more Contracts is performed, undertaken or assumed.

B. The Bidder is specifically advised that any person, firm or party, to whom it is proposed to award a sub-contract under this contract must be acceptable to the City. Approval for the proposed sub-contract Award cannot be given by the City until the proposed Sub-contractor has submitted evidence showing that it has fully complied with any reporting requirements to which it is, or was, subject.

C. The contractor, shall, within ten (10) days after award of the Contract, submit to the City in writing, names and addresses and respective amounts of money for proposed contracts with Sub-contractors/major suppliers. The City will review and may direct the Contractor that they shall not employ any that are not acceptable as

provided above.

D. The sub-contractor shall abide by and comply with all local, State and federal laws and regulations relating to contracts involving public funds and the development/construction of public works, buildings, or facilities.

20. PAYMENTS TO SUB-CONTRACTORS

A. Within seven days after the receipt of amounts paid by the City for work performed by a sub-contractor under this contract, the Contractor shall either:

1. Pay the sub-contractor for the proportionate share of the total payment received from the City attributable to the work performed by the sub-contractor under this contract; or,

2. Notify the City and sub-contractor, in writing, of his intention to withhold all or a part of the sub-contractor's payment and the reason for non-payment.

B. The Contractor shall pay interest to the sub-contractor on all amounts owed that remain unpaid beyond the seven day period except for amounts withheld as allowed in item 2 above.

C. Unless otherwise provided under the terms of this contract, interest shall accrue at the rate of one percent per month.

D. The Contractor shall include in each of its sub-contracts a provision requiring each Sub-contractor to include or otherwise be subject to the same payment and interest requirements as set forth above with respect to each lower-tier sub-contractor.

E. The Contractor's obligation to pay an interest charge to a sub-contractor pursuant to this provision may not be construed to be an obligation of the City.

21. BOND – PERFORMANCE, MATERIAL, & LABOR

A. When required by the specifications herein, the successful Bidder or Bidders shall, within ten (10) calendar days after acceptance of the Bidder's bid by the City, furnish a performance bond for 100% of the full amount of the contract from insurance companies having not less than A+ Policyholders Rating from the most recent Alfred M. Best and Co., Inc. listing available. Certification of the insurance company's rating shall be provided prior to contract implementation and quarterly thereafter until contract completion. Should such rating fall below the required A+ level during performance of the contract, it will be the contractor's responsibility to notify the City and provide a new bond from an insurance company whose rating meets the City's requirements.

B. When required by the specifications herein, all Bidders shall submit with the bid a bid bond. A letter of credit may be furnished in lieu of a bid bond only if the

following conditions are met: 1) An irrevocable letter of credit must be obtained from an accredited bank which shall include an agreement that the bank will honor a demand by the City for payment due to Plaintiff failure to complete the project. 2) An irrevocable letter of credit must be in writing and signed by an authorized representative of the bank. 3) The irrevocable letter of credit must expressly state that it is irrevocable until the bid has been awarded. 4) The letter of credit must be for the percentage specified in the bid documents.

C. The City may reject the use of an irrevocable letter of credit if the financial soundness of the issuing bank is found to be unacceptable.

D. In the event that the Bidder fails to furnish a performance bond in said period of ten (10) calendar days after acceptance of the Bidder's bid by the City, the City may withdraw its acceptance of the bid and retain the Bidder's deposit as liquidated damages and not as a penalty.

E. If the contractor has more than one project for which there is a contract with the City of Evanston the contractor shall provide a separate Performance Bond for each project.

22. INDEMNITY

A. The Contractor shall defend, indemnify and hold harmless the City and its officers, elected and appointed officials, agents, and employees from any and all liability, losses, or damages as a result of claims, demands, suits, actions, or proceedings of any kind or nature, including but not limited to costs, and fees, including attorney's fees, judgments or settlements, resulting from or arising out of any negligent or willful act or omission on the part of the Contractor or Contractor's sub-contractors, employees, agents or sub-contractors during the performance of this Agreement. Such indemnification shall not be limited by reason of the enumeration of any insurance coverage herein provided. This provision shall survive completion, expiration, or termination of this Agreement.

B. Nothing contained herein shall be construed as prohibiting the City, or its officers, agents, or employees, from defending through the selection and use of their own agents, attorneys, and experts, any claims, actions or suits brought against them. The Contractor shall be liable for the reasonable costs, fees, and expenses incurred in the defense of any such claims, actions, or suits. Nothing herein shall be construed as a limitation or waiver of defenses available to the City and employees and agents, including but not limited to the Illinois Local Governmental and Governmental Employees Tort Immunity Act, 745 ILCS 10/1-101 *et seq.*

C. At the City Corporation Counsel's option, Contractor must defend all suits brought upon all such Losses and must pay all costs and expenses incidental to them, but the City has the right, at its option, to participate, at its own cost, in the defense of any suit, without relieving Contractor of any of its obligations under this Agreement. Any settlement of any claim or suit related to this Project by Contractor must be

made only with the prior written consent of the City Corporation Counsel, if the settlement requires any action on the part of the City.

D. To the extent permissible by law, Contractor waives any limits to the amount of its obligations to indemnify, defend, or contribute to any sums due under any Losses, including any claim by any employee of Contractor that may be subject to the Illinois Workers Compensation Act, 820 ILCS 305/1 et seq. or any other related law or judicial decision, including but not limited to, Kotecki v. Cyclops Welding Corporation, 146 Ill. 2d 155 (1991). The City, however, does not waive any limitations it may have on its liability under the Illinois Worker Compensation Act, the Illinois Pension Code or any other statute.

E. The Contractor shall be responsible for any losses and costs to repair or remedy work performed under this Agreement resulting from or arising out of any act or omission, neglect, or misconduct in the performance of its Work or its sub-contractors' work. Acceptance of the work by the City will not relieve the Contractor of the responsibility for subsequent correction of any such error, omissions and/or negligent acts or of its liability for loss or damage resulting therefrom.

23. CONTRACTOR'S LIABILITY INSURANCE

A. THE CONTRACTOR SHALL NOT COMMENCE WORK UNDER THIS CONTRACT UNTIL THEY HAVE OBTAINED ALL INSURANCE REQUIRED HEREIN AND SUCH INSURANCE HAS BEEN APPROVED BY THE CITY. Nor shall the contractor allow any sub-contractor to commence work until all similar insurance required of the sub-contractor has been so obtained.

B. The City of Evanston shall be named as an additional insured on the policy of the contractor for whatever the policy limits are for the contractor, but in no event shall the Comprehensive General Liability limits be less than $3,000,000.00.

C. If the contractor has more than one project for which he has a contract with the City of Evanston there shall be separate Certificates of Insurance naming the City as an additional insured on each separate policy.

D. In the event of accidents, injuries, or unusual events, whether or not any injury occurred, the contractor shall promptly furnish the City with copies of all reports of such incidents.

E. The contractor shall furnish one (1) copy of a certificate, with the City named as an additional insured, showing the following minimum coverage with insurance company acceptable to the City.

24. PRE-CONSTRUCTION MEETING

A. A pre-construction meeting will be scheduled for the successful Contractor at a date immediately following awarding of the Contracts.

25. LIQUIDATED DAMAGES

A. The Contractor shall, and agrees to pay, per calendar day, the amount listed in the Schedule of Deductions presented in Article 108.09 of the Standard Specifications (based upon the total Contract Price) as liquidated damages for failure to meet the completion deadlines identified below:

Substantial Completion Deadline:	September 27, 2024
Final Completion Deadline:	October 25, 2024

B. Substantial Completion shall be defined as the stage in the progress of the work when the work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the City can occupy or utilize the work for its intended use. Substantial Completion will be certified by the issuance of a Certificate of Substantial Completion, to be issued by the City's representative, when the Contractor has satisfied the above statement.

C. Final Completion shall be defined as the stage in the progress of the work when all work on site is fully complete, including punch list work.

26. EXTENSION OF TIME

A. Delays due to causes beyond the control of the contractor other than such as reasonable would be expected to occur in connection with or during the performance of the work, may entitle the contractor to an extension of time for completing the work sufficient to compensate for such delay. No extension of time shall be granted, however, unless the contractor shall notify the City in writing thereof, within ten (10) days from the initiation of the delay and unless he shall, within ten (10) days after the expiration of the delay, notify the City in writing of the extension of time claimed on account thereof and then only to the extent, if any, allowed by the City.

27. DEFAULT

A. The City may, subject to the provisions of this section, by written notice of default to Contractor, terminate the whole or any part of this contract in any one of the following circumstances:

1. if the Contractor fails to perform the services within the time specified herein, or any extension thereof; or
2. if the contractor fails to perform any of the other provisions of this contract, or so fails to make progress as to endanger performance of this contract in accordance with its terms, and in either of these two circumstances does not cure failure within a period of 10 days (or such other extended period as the City may authorize in writing) after receipt of notice from the City specifying such failure

B. In the event the City terminates this contract in whole or in part as provided in this

section, the City may procure, upon such terms and in such manner as the City may deem appropriate, services similar to those so terminated, and the Contractor will be liable to the City for any excess costs for such similar services.

C. The Contractor will not be liable for any excess of costs if acceptable evidence has been submitted to the City that the failure to perform the contract was due to causes beyond the control and without fault or negligence of the Contractor.

D. Contractors who default may not be considered for awards of future City contracts.

28. USE OF PREMISES

A. The contractor shall confine his apparatus, the storage of materials and the operations of his workers, to limits indicated by law, ordinances, permits or directions of the City.

29. DISCLOSURES AND POTENTIAL CONFLICTS OF INTEREST (30 ILCS 500/50-35)

A. The City of Evanston's Code of Ethics prohibits public officials or employees from performing or participating in an official act or action with regard to a transaction in which he has or knows he will thereafter acquire an interest for profit, without full public disclosure of such interest. This disclosure requirement extends to the spouse, children and grandchildren, and their spouses, parents and the parents of a spouse, and brothers and sisters and their spouses.

To ensure full and fair consideration of all bids, the City of Evanston requires all Bidders including owners or employees to investigate whether a potential or actual conflict of interest exists between the Bidder and the City of Evanston, its officials, and/or employees. If the Bidder discovers a potential or actual conflict of interest, the Bidder must disclose the conflict of interest in its bid, identifying the name of the City of Evanston official or employee with whom the conflict may exist, the nature of the conflict of interest, and any other relevant information. The existence of a potential or actual conflict of interest does NOT, on its own, disqualify the disclosing Bidder from consideration. Information provided by Bidders in this regard will allow the City of Evanston to take appropriate measures to ensure the fairness of the bidding process.

The City of Evanston requires all bidders to submit a certification, enclosed with this bid packet, that the bidder has conducted the appropriate investigation and disclosed all potential or actual conflicts of interest.

By submitting a bid, all Bidders acknowledge and accept that if the City of Evanston discovers an undisclosed potential or actual conflict of interest, the City of Evanston may disqualify the Bidder and/or refer the matter to the appropriate authorities for investigation and prosecution.

INSURANCE REQUIREMENTS

TYPE OF INSURANCE	MINIMUM INSURANCE COVERAGE	
	Consequent Death	Bodily Injury and Property Damage
	Each Occurrence	Aggregate
Commercial General Liability including:	$3,000,000	$3,000,000
1. Comprehensive form		
2. Premises - Operations		
3. Explosion & Collapse Hazard		
4. Underground Hazard		
5. Products/Completed Operations Hazard		
6. Contractual Insurance – With an endorsement on the face of the certificate that it includes the "Indemnity" paragraph of the specifications.	**Insurance Certificate Must State: The City Of Evanston is Named as Additional Insured**	
7. Broad Form Property Damage - construction projects only		
8. Independent contractors		
9. Personal Injury		
Automobile Liability Owned, Non-owned or Rented	$ 1,000,000	$1,000,000
Workmen's Compensation and Occupational Diseases As required by applicable laws.		
Employer's Liability		$ 500,000

Thirty day notice of cancellation required on all certificates.

EXHIBIT A – BID FORM
For
Service Center North Fuel Island Replacement

(BID #23-58)

1.01 BID TO:

THE CITY OF EVANSTON
2100 Ridge Avenue
Evanston, Illinois 60201

Hereinafter called “OWNER”.

1.02 BID FROM:

_____
(Hereinafter call "BIDDER")

_____
Address

_____
Telephone Number

_____
Fax Number

1.03 BID FOR: **SERVICE CENTER NORTH FUEL ISLAND REPLACEMENT**

1.04 ACKNOWLEDGEMENT:

A. The Bidder, in compliance with the Invitation for Bids, having carefully examined the Drawings and Project Manual with related documents and having visited the site of the proposed Work, and being familiar with all of the existing conditions and limitations surrounding the construction of the proposed project, including the structure of the ground, subsurface conditions, the obstacles which may be encountered, local restrictions, and all other relevant matters concerning the Work to be performed, hereby PROPOSES to perform everything required to be performed, and to provide all labor, materials, necessary tools and equipment, expendable equipment, all applicable permits and taxes and fees, and provide all utility and transportation services necessary to perform and complete in a workmanlike

manner the Project in accordance with all the plans, specifications and related Contract Documents as prepared by the City of Evanston.

B. The undersigned hereby acknowledges receipt of Invitation of Bids, Instruction to Bidder, the Project Manual, Drawings, and other Contract Documents and acknowledges receipt of the following Addenda:

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

1.05 GENERAL STATEMENTS

A. The undersigned has checked all of the figures contained in this proposal and further understands that the Owner will not be responsible for any errors or omissions made therein by the undersigned.

B. It is understood that the right is reserved by the Owner to reject any or all proposals, to waive all informality in connection therewith and to award a Contract for any part of the work or the Project as a whole.

C. The undersigned declares that the person(s) signing this proposal is/are fully authorized to sign on behalf of the named firm and to fully bind the named firm to all the conditions and provisions thereof.

D. It is agreed that no person(s) or company other than the firm listed below or as otherwise indicated hereinafter has any interest whatsoever in this proposal or the Contract that may be entered into as a result thereof, and that in all respects the proposal is legal and fair, submitted in good faith, without collusion or fraud.

E. It is agreed that the undersigned has complied and/or will comply with all requirements concerning licensing and with all other local, state and national laws, and that no legal requirement has been or will be violated in making or accepting this proposal, in awarding the Contract to him, and/or in the prosecution of the Work required hereunder.

F. To be considered a bona fide offer, this proposal must be completed in full and accompanied by a bid deposit or a bid bond when required by Contract Documents or Addenda.

1.06 ALTERNATES

A. When alternate proposals are required by Contract Documents or Addenda thereto, the undersigned proposes to perform alternates for herein stated additions to or deductions from hereinbefore stated Base Bid. Additions and deductions include all modifications of Work or additional Work that the undersigned may be required to perform by reason of the acceptance of alternates.

1.07 ALLOWANCE

A. The allowance is intended to address items not able to be precisely determined prior to bidding including unforeseen conditions that are discovered during the course of construction. At the end of the project, unspent allowance shall be credited to owner via change order. See Section 01 21 00 – Allowances for additional information.

1.08 AGREEMENT

A. In submitting this Bid, the undersigned agrees:
   1. To hold this Bid open for sixty (60) days from submittal date.
   2. To enter into and execute a Contract with the Owner within ten (10) days after receiving Notice of Award from the Owner.
   3. To accomplish the work in accordance with the Contract Documents.
   4. To complete the work by the time stipulated in the General Conditions

B. The Owner reserves the right to reject any and all Bids and to waive any informalities in Bidding.

1.09 SCHEDULE

A. See General Conditions for required schedule of completion dates.

1.10 PROPOSED PRICES

A. The Bidder hereby proposes to furnish all labor, materials, equipment, transportation, construction plant and facilities necessary to complete, in a workmanlike manner and in accordance with the contract documents, the contract of work bid upon herein for compensation in accordance with the following prices:

BASE BID AMOUNT: **$**_____
(EXCLUDES CONTAMINATED SOIL WORK)

ALLOWANCE 1 (CONTAMINATED SOIL WORK): **$** +200,000

ALLOWANCE 2 (ADDITIONAL WORK – GENERAL): **$** +80,000

TOTAL BASE BID AMOUNT: **$**_____

ALTERNATE 1 – LOCAL EMPLOYMENT PROGRAM
This work includes complying with the City's Local Employment Program as described in the construction documents. The ADD/DEDUCT LUMP SUM PRICE, if awarded to the undersigned, shall be:

ALTERNATE 1 AMOUNT: **$**_____

1.11 UNIT PRICING LIST

The undersigned submits the following UNIT PRICING LIST to be performed as shown on the Plans and/or described in the Specifications, and agrees that items of work not specifically mentioned in the Schedule which are necessary and required to complete the work intended shall be done incidental to and as part of the work for which a unit price is given, and understands that no additional payment will be made for such incidental work from the estimated quantities shown below. The unit prices below shall be used to determine the costs to assign to Allowance 1 (Contaminated Soil Work) for properly authorized work.

Item	Description	Unit	Estimated Quantity	Unit Cost *
1	Removal and Disposal of Contaminated Soils	$/ton	600 tons	$
2	Backfill for Removal and Disposal of Contaminated Soils	$/ton	600 tons	$

* Unit costs to be provided by Bidder

1.12 BID SECURITY

If required by the bid documents, a scanned copy of the bid bond must be included with the bid electronic submission. The City is currently not able to accept a certified check, bank cashier's check or electronic bid bond at this time.

A. The City of Evanston Civic Center is unable to receive in person drop-off and it is closed to the public. The original bid bond must be mailed within ten (10) days after the due date, to the City of Evanston Purchasing Department, 2100 Ridge Avenue - Room 4200 Evanston, Illinois 60201 Attention Purchasing Manager using the USPS (certified or priority), UPS or FedEx mail options in order to have a tracking number.

B. Accompanying this electronic submittal is a scanned copy of a bank draft, bid bond, Cashier's check or Certified check as surety in the amount of not less than five percent (5%) of the Total Bid payable to the City of Evanston.

The amount of the check or draft is: $_____

If this bid is accepted and the undersigned shall fail to execute a contract and contract bond as required it is hereby agreed that the amount of the check or draft or bidder's bond substituted in lieu thereof, shall become the property of the City and shall be considered as payment of damages due to delay and other causes suffered by the City because of the failure to execute said contract and contract bond; otherwise said check or draft shall be returned to the undersigned.

In the event that one check or draft is intended to cover two or more bids, the amount must be equal to the sum of the project proposal guarantees of the individual sections covered.

If the check or draft is placed on another project proposal, state below where it may be found, as follows: The check or draft will be found in the project proposal for: _____.

1.13 PERFORMANCE/PAYMENT BOND

The undersigned bidder agrees to provide Performance Bond and Payment Bond executed in accordance with Contract Performance Bond form furnished by and acceptable to the Owner written with _____

_____

in the amount of 100% of the Contract Sum (Total Base Bid and all accepted alternatives and adjustments) the cost of which is included in the Bid.

Cost of bond for change order is _____ percent of change order cost.

1.14 LIQUIDATED DAMAGES

The undersigned Bidder understands and agrees to the provisions stated under "LIQUIDATED DAMAGES" in the General Conditions and shall be assessed at the specified daily rate for each calendar day or partial calendar day until completion as defined herein.

1.15 MATERIAL SUBSTITUTION SHEET

The following is a schedule of substitute materials I propose to furnish on this job, with the difference in price being added to or deducted from the Base Bid. The Base Bid is understood to include only those items which are definitely specified by trade names or otherwise.

I understand that if no price difference is indicated, then the selection of materials is optional with the Owner, and approval or rejection of the substitution below will be indicated prior to signing of Contracts.

PRODUCT NAME AND/OR MANUFACTURER	ADD	DEDUCT
_____	_____	_____
_____	_____	_____
_____	_____	_____

1.16 PROPOSAL SIGNATURE (REQUIRED)

A. SOLE PROPRIETOR

Signature of Bidder: _____

SUBSCRIBED AND SWORN to before me this _____ day of_____, 20__

_____
Notary Public

Commission Expires: _____

B. PARTNERSHIP

Signature of All Partners: _____

_____
Name (typed or printed)

_____

_____
Name (typed or printed)

SUBSCRIBED AND SWORN to before me this ____ day of _____, 20___

_____ Commission Expires: _____
Notary Public

C. CORPORATION

Signature of Authorized Official: _____

Title: _____

Name above (typed or printed): _____

(If other than the president, attach a certified copy of that section of corporate by-laws or other authorization by the Corporation which permits the person to execute the offer for the Corporation.)

(Corporate Seal)

Attest: _____
Secretary

SUBSCRIBED AND SWORN to before me this ____ day of _____, 20___

_____ Commission Expires: _____
Notary Public

1.17 DISCLOSURE

A. The undersigned duly sworn deposes and says on oath that the bidder has withheld no disclosures of ownership interest and the information provided herein to the best of its knowledge is current and said undersigned has not entered into any agreement with any other bidder or prospective bidder or with any other person, firm or corporation relating to the price named in said proposal or any other proposal, nor any agreement or arrangement under which any person, firm or corporation is to refrain from bidding, nor any agreement or arrangement for any act or omission in restraint of free competition among bidders and has not disclosed to any person, firm or corporation the terms of this bid or the price named herein.

Bidder: _____

Business Address: _____

_____

Telephone Number: _____

1.18 CONTACTS

A. In the event the Evanston City Council approves this bid response, list the name, address, telephone, and fax number of the person to be contacted:

Bidder: _____

Address: _____

_____

Telephone Number: _____

Fax Number: _____

1.19 REFERENCES

A. Provide three (3) references for which your firm has completed work of a similar scope in the past.

1. Name: _____

   Address: _____

   Contact Person: _____

   Phone: _____

   Contract Value: _____

   Contract Dates: _____

2. Name: _____

   Address: _____

   Contact Person: _____

   Phone: _____

   Contract Value: _____

   Contract Dates: _____

3. Name: _____

   Address: _____

   Contact Person: _____

   Phone: _____

   Contract Value: _____

   Contract Dates: _____

EXHIBIT B

City of Evanston M/W/D/EBE Policy

A City of Evanston goal is to provide contracting and sub-contracting opportunities to Minority Business Enterprises, Women Business Enterprises, Disadvantaged and Evanston Business Enterprises. The goal of the Minority, Women, Disadvantaged and Evanston Business Enterprise Program (M/W/D/EBE) is to assist such businesses with opportunities to grow. To assist such growth, the City's goal is to have general contractors utilize M/W/D/EBEs to perform no less than 25% of the awarded contract.

Firms bidding on projects with the City must work to meet the 25% goal or request a waiver from participation. It is advised that bidders place advertisements requesting sub-contractors and that they email or contact individual firms that would be appropriate to partner in response to the project. For samples of possible advertisements, see the City of Evanston's Business Diversity Section http://www.cityofevanston.org/business/business-diversity/ (Sample Advertisement). If you request a paper copy of the additional documents, it will be available free of charge from the Purchasing Office, 2100 Ridge Road Suite 4200, Evanston, IL 60201.

If a bidder is unable to meet the required M/W/D/EBE goal, the Bidder must seek a waiver or modification of the goal on the attached forms. Bidder must include:

1. A narrative describing the Bidder's efforts to secure M/W/D/EBE participation prior to the bid opening.
2. Documentation of each of the assist agencies that were contacted, the date and individual who was contacted, and the result of the conversation (see form)
3. A letter attesting to instances where the bidder has not received inquiries/proposals from qualified M/W/D/EBEs
4. Names of owners, addresses, telephone numbers, date and time and method of contact of qualified M/W/D/EBE who submitted a proposal but was not found acceptable.
5. Names of owners, addresses, telephone numbers, date and time of contact of at least 15 qualified M/W/D/EBEs the bidder solicited for proposals for work directly related to the Bid prior to the bid opening (copies must be attached).

If a bidder is selected with a Sub-contractor listed to meet the M/W/D/EBE goal, a "monthly utilization report" will be due to the City prior to each payment being issued to the Contractor. This report will include documentation of the name of the firm hired, the type of work that firm performed, etc. Should the M/W/D/EBE not be paid according to the schedule proposed in this document, the City reserves the right to cancel the contract. Examples of this monthly form can be found on the City's website: http://www.cityofevanston.org/business/business-diversity/ (MWDEBE Monthly Utilization Report).

EXHIBIT C

M/W/D/EBE PARTICIPATION COMPLIANCE FORM

I do hereby certify that

_____ (Name of firm) intends to participate as a Subcontractor or General Contractor on the project referenced above.

This firm is a (check only one):

_____ Minority Business Enterprise (MBE), a firm that is at least 51% managed and controlled by a minority, certified by a certifying agency within Illinois.

_____ Women's Business Enterprise (WBE), a firm that is at least 51% managed and controlled by a woman, certified by a certifying agency within Illinois.

_____ Disadvantaged Business Enterprise (DBE), a firm that is at least 51% managed and controlled by a disadvantaged, certified by a certifying agency within Illinois.

_____ Evanston Based Enterprise (EBE), a firm located in Evanston for a minimum of one year and which performs a "commercially useful function".

Total proposed price of response $_____

Amount to be performed by a M/W/D/EBE $_____

Percentage of work to be performed by a M/W/D/EBE _____%

Information on the M/W/D/EBE Utilized:

Name _____

Address _____

Phone Number _____

Signature of firm attesting to participation _____

Title and Date _____

Type of work to be performed _____

Please attach:

1. Proper certification documentation if applying as a M/W/DBE and check the appropriate box below. This M/W/DBE will be applying with documentation from:

❑ Cook County	❒ State Certification
❒ Federal Certification	❒ Women's Business Enterprise National Council
❒ City of Chicago	❒ Chicago Minority Supplier Development Council

2. Attach business license if applying as an EBE

EXHIBIT C

M/W/D/EBE UTILIZATION SUMMARY REPORT

The following Schedule accurately reflects the value of each MBE/WBE/DBE/EBE sub-agreement, the amounts of money paid to each to date, and this Pay Request. The total proposed price of response submitted is _____.

MBE/WBE/DBE/EBE FIRM NAME	FIRM TYPE (MBE/WBE/ DBE/EBE)	SERVICES PERFORMED	AMOUNT OF SUB-CONTRACT	PERCENT OF TOTAL CONTRACT AMOUNT
			$	
			$	
			$	
			$	
			$	
			$	
			$	
			$	
			$	
			$	
			$	
			$	
			$	
			$	
TOTAL			$	

EXHIBIT D

M/W/D/EBE PARTICIPATION WAIVER REQUEST

I am _____ of _____, and I have authority to
(Title) (Name of Firm)

execute this certification on behalf of the firm. I _____ do
(Name)

hereby certify that this firm seeks to waive all or part of this M/W/D/EBE partcipation goal

for the following reason(s):

(CHECK ALL THAT APPLY. SPECIFIC SUPPORTING DOCUMENTATION MUST BE ATTACHED.)

_____ 1. No M/W/D/EBEs responded to our invitation to bid.

_____ 2. An insufficient number of firms responded to our invitation to bid.

For #1 & 2, please provide a narrative describing the outreach efforts from your firm and proof of contacting at least 15 qualified M/W/D/EBEs prior to the bid opening. Also, please attach the accompanying form with notes regarding contacting the Assist Agencies.

_____ 3. No sub-contracting opportunities exist.

Please provide a written explanation of why sub-contracting is not feasible.

_____ 4. M/W/D/EBE participation is impracticable.

Please provide a written explanation of why M/W/D/EBE participation is impracticable.

Therefore, we request to waive _____of the 25% utilization goal for a revised goal of _____%.

Signature:_____ Date: _____
(Signature)

EXHIBIT E

Construction Contractors' Assistance Organizations ("Assist Agencies") Form

AGENCY	DATE CONTACTED	CONTACT PERSON	RESULT OF CONVERSATION
Association of Asian Construction Enterprises (AACE) 5500 Touhy Ave., Unit K Skokie, IL. 60077 Phone: 847-5259693 Perry Nakachii, President			
Black Contractors United (BCU) 400 W. 76th Street Chicago, IL 60620 Phone: 773-483-4000; Fax: 773-483-4150 Email: bcunewera@ameritech.net			
Chicago Minority Business Development Council 105 West Adams Street Chicago, Illinois 60603 Phone: 312-755-8880; Fax: 312-755-8890 Email: info@chicagomsdc.org Shelia Hill, President			
Evanston Minority Business Consortium, Inc. P.O. Box 5683 Evanston, Illinois 60204 Phone: 847-492-0177 Email: embcinc@aol.com			
Federation of Women Contractors 5650 S. Archer Avenue Chicago, Illinois 60638 Phone: 312-360-1122; Fax: 312-360-0239 Email: FWCChicago@aol.com Contact Person: Beth Doria Maureen Jung, President			
Hispanic American Construction Industry (HACIA) 901 W. Jackson, Suite 205 Chicago, IL 60607 Phone: 312-666-5910; Fax: 312-666-5692 Email: info@haciaworks.org			
Women's Business Development Ctr. 8 S. Michigan Ave, Suite 400 Chicago, Illinois 60603 Phone: 312-853-3477 X220; Fax: 312-853-0145 Email: wbdc@wbdc.org Carol Dougal, Director			

PLEASE NOTE: Use of Construction Contractor's Assistance Organization (Assist Agencies") Form and agencies are for use as a resource only. The agencies and or vendors listed are not referrals or recommendations by the City of Evanston.

EXHIBIT F

ALTERNATE BID #1
CITY OF EVANSTON
LOCAL EMPLOYMENT PROGRAM (LEP) COMPLIANCE

Effective Date January 1, 2015

City of Evanston Ordinance 60-O-14, Local Employment Program (LEP) New Penalties:

- **Ordinance 60-O-14**, Amendment to the MWDEBE/LEP revising the penalty section from a $100/per day to a 1.0% of total project value penalty can be found at: Ordinance 60-O-14 Amendment MWEDBE LEP of the Evanston City Code Section 1-17-1 (C) can be found at Municode Library. The following are excerpts from Ordinance 60-O-14, Amending City Code Section 1-17-1(C) (11): Penalty.

If the contactor or sub-contractor fails to comply: The City may impose a fine up to one percent (1.0%) of the approved project price in total. Contractors or sub-contractors that are out of compliance due to a resident termination or resignation shall immediately notify the Business Workforce Compliance Coordinator of this occurrence within two (2) business days. Subsequently, the contractor or sub-contractor shall have five (5) additional business days to replace a terminated or resigned worker with another resident.

If the contactor or sub-contractor fails to comply: If the contractor or sub-contractor fails to make the replacement or to notify the Business Workforce Compliance Coordinator of this occurrence, the offending party will also be subject to a penalty up to one percent (1.0%) of the approved project price. If the noncompliant contractor makes a good faith effort to replace the resident, the fine may be waived.

If the contactor or sub-contractor fails to comply: At the sole discretion of the City, a contractor or sub-contractor that has violated the terms of the Local Employment Program within a three-year period may be determined a non-responsible bidder and excluded from bidding on future projects for a period of not less than one year.

If the employee (LEP Evanston resident) fails to comply: At the sole discretion of the City, an employee that has been hired through the LEP may be removed from the program for a period of not less than one year for failing to adhere to program guidelines or due to termination by the contractor for cause. Such termination process will be reviewed by the Business Workforce Compliance Coordinator.

****Detailed Local Employment Program Instructions "How to Comply" can be found at: Local Employment Program Detailed Instructions**

Local Employment Program or Exhibit F Questions: City staff is available for assistance to help with compliance. Submit questions in writing to Nathan Norman, Youth/Young Adult Program Supervisor at nnorman@cityofevanston.org or Tammi Nunez, Purchasing Manager at tnunez@cityofevanston.org.

EXHIBIT F

ALTERNATE BID #1 - LOCAL EMPLOYMENT PROGRAM COMPLIANCE

CITY CODE SECTION 1-17-1(C): LOCAL EMPLOYMENT PROGRAM

I have read and understood the requirements of the City of Evanston Local Employment Program ("LEP") as set forth in City of Evanston Code Section 1-17-1(C): Local Employment Program. I intend to comply with the program as follows:

Estimated total labor cost = $ _____ 15% of total labor cost = $ _____

_____ My total bid, including all alternates, is under $250,000, and the LEP does not apply.

_____ My total bid, including all alternates, is equal to or greater than $250,000, and I already employ, and will continue to employ for the duration of the contract for which I am submitting this bid, Evanston residents (residing in zip codes 60201 or 60202) for at least 15% of all hours worked at the construction site by construction trade workers.

_____ My total bid, including all alternates, is equal to or greater than $250,000, and I will employ, for the duration of the contract for which I am submitting this bid, through use of the City of Evanston database or otherwise, Evanston residents (residing in zip codes 60201 or 60202) for at least 15% of all hours worked at the construction site by construction trade workers.

_____ My total bid, including all alternates, is equal to or greater than $250,000, and I have been unable to comply with the LEP requirements but am willing to work with the City to achieve compliance.

_____ My total bid, including all alternates, is equal to or greater than $250,000, and after having made sincere attempt to comply as noted below, I seek a waiver on a portion or all of the LEP requirements on this contract. Complete next section "Reasons for Waiver Request" below.

I UNDERSTAND THAT FAILURE TO COMPLY WITH THE LEP, REGARDLESS OF INTENT, MAY RESULT IN MAXIMUM PENALTY AS SET FORTH IN CITY CODE SECTION 1-17-1(C)(11), AS AMENDED.

WAIVER WILL BE GRANTED ONLY AFTER SINCERE ATTEMPT TO COMPLY*

REASONS FOR WAIVER REQUEST: PLEASE CHECK ALL THAT APPLY AND COMPLETE INFORMATION REQUESTED:

1. I have made sincere attempt as otherwise indicated below, but have nonetheless been unable to comply.

a. I do or will employ Evanston residents for the project, but such employment amounts to ____**%** of total labor cost.

2. The nature of the job is so technical that after having made sincere attempt as otherwise indicated below, I have been unable to locate any Evanston residents qualified to perform any aspects of the work. Please describe applicable job requirements/qualifications. Attach separate sheet if necessary:

_____

_____

***THE FOLLOWING DEMONSTRATE **SINCERE ATTEMPT TO COMPLY**: PLEASE CHECK EACH BOX COMPLETED, AS APPLICABLE:

3. I have utilized the local resident database and otherwise worked with the City in attempt to hire Evanston residents in compliance with LEP on this project, and have nonetheless been unable to comply;

4. I have placed one or more ads in a local newspaper seeking to hire Evanston residents in compliance with LEP on this project, and have nonetheless been unable to comply; and

5. If I am utilizing union labor, I have contacted Chicagoland labor unions to request Evanston residents for employment in compliance with LEP on this project and have nonetheless been unable to comply.

I have read The City of Evanston, Local Employment Program (LEP) requirements as set forth in City Code Section 1-17-1(C): Local Employment Program. I understand and will comply with the LEP requirements for this project with respect to the job and/or any waiver, as applicable. **I UNDERSTAND THAT IF MY APPLICATION IS NOT COMPLETE, MY BID MUST BE REJECTED.**

SIGNED:

_____ _____ _____

Signature Printed Name and Title Date

On behalf of Company: _____

_____ _____ _____

Signature Printed Name and Title Date

On behalf of Company: _____

EXHIBIT G

CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY (Only if Contract Exceeds $10,000)

This certification is required pursuant to Executive Order 11246 (30 F.R. 12319-25). The implementing rules and regulations provide that any bidder or prospective contractor, or any of their proposed sub-contractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or sub-contract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicates that the bidder has not filed a compliance report due under applicable instructions, such bidder shall be required to submit a compliance report within seven calendar days after bid opening. No contract shall be awarded unless such report is submitted.

CERTIFICATION OF BIDDER

Name and Address of Bidder (Include ZIP Code)

IRS EMPLOYER I.D. NUMBER 36-_____

1. Bidder has participated in a previous contract or sub-contract subject to the Equal Opportunity Clause. ____Yes ___No

2. Bidder has filed all compliance reports due under applicable instructions. ___Yes ___No

3. Have you ever been or are you being considered for sanction due to violation of Executive Order 11246, as amended? ___Yes ___No

Name:_____

Title: _____

Signature: _____

Date: _____

EXHIBIT H

DISCLOSURE OF OWNERSHIP INTERESTS

City of Evanston Ordinance 15-0-78 requires all persons (APPLICANT) seeking to do business with the City to provide the following information with their bid. Every question must be answered. If the question is not applicable, answer with "NA".

APPLICANT NAME: _____

APPLICANT ADDRESS: _____

TELEPHONE NUMBER: _____

FAX NUMBER: _____

APPLICANT is (**Check One**)

1. Corporation ( ) 2. Partnership ( ) 3. Sole Owner ( ) 4. Association ( )

5. Other ( ) _____

Please answer the following questions on a separate attached sheet if necessary.

SECTION I - CORPORATION

1a. Names and addresses of all Officers and Directors of Corporation.

_____

_____

_____

1b. (Answer only if corporation has 33 or more shareholders.) Names and addresses of all those shareholders owning shares equal to or in excess of 3% of the proportionate ownership interest and the percentage of shareholder interest. (Note: Corporations which submit S.E.C. form 10K may substitute that statement for the material required herein.)

_____

_____

_____

1c. (Answer only if corporation has fewer than 33 shareholders.) Names and addresses of all shareholders and percentage of interest of each herein. (Note: Corporations which submit S.E.C. form 10K may substitute that statement for the material requested herein.)

_____

_____

_____

SECTION 2 - PARTNERSHIP/ASSOCIATION/JOINT VENTURE

2a. The name, address, and percentage of interest of each partner whose interests therein, whether limited or general is equal to or in excess of 3%.

_____

_____

_____

2b. Associations: The name and address of all officers, directors, and other members with 3% or greater interest.

_____

_____

_____

SECTION 3 - TRUSTS

3a. Trust number and institution.

_____

3b. Name and address of trustee or estate administrator.

_____

_____

_____

3c. Trust or estate beneficiaries: Name, address, and percentage of interest in total entity.

_____

_____

_____

SECTION 4 - ALL APPLICANTS - ADDITIONAL DISCLOSURE

4a. Specify which, if any, interests disclosed in Section 1, 2, or 3 are being held by an agent or nominee, and give the name and address of principal.

_____

_____

_____

4b. If any interest named in Section 1, 2, or 3 is being held by a "holding" corporation or other "holding" entity not an individual, state the names and addresses of all parties holding more than a 3% interest in that "holding" corporation or entity as required in 1(a), 1(b), 1(c), 2(a), and 2(b).

_____

_____

_____

4c. If "constructive control" of any interest named in Sections 1, 2, 3, or 4 is held by another party, give name and address of party with constructive control. ("Constructive control" refers to control established through voting trusts, proxies, or special terms of venture of partnership agreements.)

_____

_____

_____

I have not withheld disclosure of any interest known to me. Information provided is accurate and current.

_____ _____

Date Signature of Person Preparing Statement

_____

Title

ATTEST: _____ (Notary Seal)

Notary Public

Commission Expires: _____

EXHIBIT I

ADDITIONAL INFORMATION SHEET

Bid/Proposal Name: _____

Bid/Proposal Number #: _____

Company Name: _____

Contact Name: _____

Address: _____

City,State, Zip: _____

Telephone/FAX: #_____

E-mail: _____

Comments: _____

_____

_____

_____

_____

_____

_____

EXHIBIT J

CERTIFICATE OF COMPLIANCE
WITH PREVAILING WAGE RATE ACT

The undersigned, upon being first duly sworn, hereby certifies to the City of Evanston, Cook, County, Illinois, that all work under this contract shall comply with the Prevailing Wage Rate Act of the State of Illinois, 820 ILCS 130 *et seq*, and as amended by Public Acts 86-799 and 86-693 and current City of Evanston Resolution, with rates to be paid in effect at time work is performed. Contractors shall submit monthly certified payroll records to the city.

Name of Contractor: _____

By: _____

By: State of _____, County of _____

Subscribed and sworn to before me this _____ day

of_____, _____.

Notary Public

EXHIBIT K

MAJOR SUB-CONTRACTORS LISTING

The following Tabulation of Major Sub-contractors shall be attached and made a condition of the Bid. The Bidder expressly understands and agrees to the following provisions:

A. If awarded a Contract as a result of this Bid, the major sub-contractors used in the prosecution of the work will be those listed below.

B. The following list includes all sub-contractors who will perform work representing 5% (five percent) or more of the total Base Bid.

C. The sub-contractors listed below are financially responsible and are qualified to perform the work required.

D. The sub-contractors listed below comply with the requirements of the Contract Documents.

E. Any substitutions in the sub-contractors listed below shall be requested in writing by the Contractor and must be approved in writing by the Owner. All pertinent financial, performance, insurance and other applicable information shall be submitted with the request for substitutions(s). Owner shall respond to such requests within 14 calendar days following the submission of all necessary information to the full satisfaction of the Owner.

Category	**Name of Sub-contractor**	**Address and Phone Number**

(Attach additional sheets as required)

END OF SECTION

EXHIBIT L

CONFLICT OF INTEREST

_____, hereby certifies that it has conducted an investigation into whether an actual or potential conflict of interest exists between the Bidder, its owners and employees and any official or employee of the City of Evanston.

Bidder further certifies that it has disclosed any such actual or potential conflict of interest and acknowledges if Bidder/proposer has not disclosed any actual or potential conflict of interest, the City of Evanston may disqualify the bid/proposal.

_____

(Name of Bidder/proposer if the Bidder/proposer is an Individual)
(Name of Partner if the Bidder/proposer is a Partnership)
(Name of Officer if the Bidder/proposer is a Corporation)

The above statements must be subscribed and sworn to before a notary public.
Subscribed and Sworn to this _____ day of _____, 20

_____ (Notary Seal)
Notary Public

Commission Expires: _____

EXHIBIT M

SIGNATURE FORM
THE SECTION BELOW MUST BE COMPLETED IN FULL AND SIGNED

The undersigned hereby certifies that they have read and understand the contents of this solicitation and attached service agreements, and agree to furnish at the prices shown any or all of the items above, subject to all instructions, conditions, specifications and attachments hereto. Failure to have read all the provisions of this solicitation shall not be cause to alter any resulting contract or to accept any request for additional compensation. By signing this document, the proposer hereby certifies that they are not barred from bidding on this contract as a result bid rigging or bid rotating or any similar offense (720 ILCS 5/33 E-3, E-4).

Authorized Signature: _____

Company Name: _____

Typed/Printed Name: _____

Date: _____

Title: _____

Telephone Number: _____

E-mail _____

Fax Number: _____

Exhibit N

Contractor Services Agreement Acknowledgement Page

The City has attached its standard contractor services agreement as an exhibit to this bid document. Identify all exceptions to the agreement that would prevent your firm from executing it**. The City shall not consider or negotiate regarding exceptions submitted at any time after the submission of the Bidder's response.** *Please check one of the following statements:*

____I have read the contractor services agreement and plan on executing the agreement without any exceptions.

_____My firm cannot execute the City's standard contractor service agreement unless the exceptions noted below or in the attached sample contractor services agreement are made.

*****Please be aware that submitting exceptions to the contract may impact the likelihood of your firm being selected to perform this work.**

List exceptions in the area below:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Authorized Signature: _____ **Company Name:** _____

Typed/Printed Name and Title: _____ **Date:** _____

Exhibit N

CONTRACTOR SERVICES AGREEMENT

The parties referenced herein desire to enter into an agreement for professional services for

Service Center North Fuel Island Replacement
(BID #23-58)

THIS AGREEMENT (hereinafter referred to as the "Agreement") is entered into between the City of Evanston, an Illinois municipal corporation with offices located at 2100 Ridge Avenue, Evanston Illinois 60201 (hereinafter referred to as the "City"), and *[Insert Contractor name here]*, with offices located at *[Insert Contractor address here]*, (hereinafter referred to as the "Contractor"). Compensation (the "Compensation") for all basic services provided by the Contractor pursuant to the terms of this Agreement shall not exceed $*[Insert fee here]*.

Revision March 2020

TABLE OF CONTENTS

RECITALS

WHEREAS, the City intends to retain the services of a qualified and experienced contractor for the following:

Reconstruct the north fuel island at the Evanston Service Center located at 2020 Asbury Avenue in accordance with the attached exhibits.

WHEREAS, this Agreement shall include the following documents which are attached hereto:

a) City of Evanston Bid 23-58, attached as Exhibit A.

b) Contractor's response to Bid 23-58, attached as Exhibit B.

c) Any sub-contractor sub-contracts related to this Agreement, attached as Exhibit C.

d) Project Fee Schedule and hourly rates, attached as Exhibit D *(if appropriate)*.

NOW, THEREFORE, in consideration of the mutual covenants hereinafter set forth, the parties agree as follows:

1 Services and Duties of the Contractor

1.1 The Contractor shall perform professional services and provide equipment (the "Work") in accordance with Exhibits A, B, C and D. The Contractor retains the right to control the manner of performance of the services provided for in this Agreement and is an independent contractor and not agent or an employee of the City. All employees and sub-contractors of the Contractor shall likewise not be considered to be employees of the City. Contractor is solely responsible for the means and methods of all work performed under the terms of this Agreement for this Project ("the Project"). Contractor is an independent Contractor and is solely responsible for all taxes, withholdings, and other statutory or contractual obligations of any sort, including but not limited to, Worker's Compensation Insurance. Nothing in this Agreement accords any third-party beneficiary rights whatsoever to any non-party to this Agreement that any non-party may seek to enforce. Contractor acknowledges and agrees that should Contractor or its sub-contractors provide false information, or fail to be or remain in compliance with this Agreement; the City may void this Agreement.

1.2 The Contractor warrants and states that it has read the Contract Documents, and agrees to be bound thereby, including all performance guarantees as respects Contractor's work and all indemnity and insurance requirements. Contractor further affirms that it has visited the Project site and has become familiar with all special conditions, if any, at the Project site. Contractor shall perform the Work and its obligations under this Agreement in accordance with and subject to the Contract Documents to the full extent that each such provision is applicable to the Work. Contractor shall take necessary precautions to properly protect the Work of others, if any, from damage caused by operations under this Agreement. In addition, Contractor shall protect the work during normal and adverse weather conditions until the Project is complete and accepted by the City, or until the

Contractor has fully completed its work under this Agreement. Contractor's obligations include, but are not limited to, placing and adequately maintaining at or about all locations of Project work, sufficient guards, barricades, lights, and enclosures to protect the Work.

1.3 The Contractor shall not have any public or private interest and shall not acquire directly or indirectly any such interest which conflicts in any manner with the performance of its services under this Agreement.

1.4 The Contractor shall designate, in writing, a person to act as its Project Manager for the work to be performed under this Agreement. Such person shall have complete authority to transmit instructions, receive information, interpret and define the Contractor's policies and decisions with respect to the work covered by this Agreement.

1.5 The Contractor shall employ only persons duly licensed by the State of Illinois to perform the professional services required under this Agreement for which applicable Illinois law requires a license, subject to prior approval of the City. The Contractor shall employ only well qualified persons to perform any of the remaining services required under this Agreement, also subject to prior approval of the City. The City reserves the right to require replacement of Contractor, sub-contractor, or supplier personnel for any reason. Contractor will replace the unacceptable personnel at no charge to the City. For all solicitations or advertisements placed by or on behalf of Contractor for employees for this Project it will state that the Contractor is an Equal Opportunity Employer.

1.6 Pursuant to the Illinois Freedom of Information Act, 5 ILCS 140/7(2), records in the possession of others whom the City has contracted with to perform a governmental function are covered by the Act and subject to disclosure within limited statutory timeframes (five (5) working days with a possible five (5) working day extension). Upon notification from the City that it has received a Freedom of Information Act request that calls for records within the Contractor's control, the Contractor shall promptly provide all requested records to the City so that the City may comply with the request within the required timeframe. The City and the Contractor shall cooperate to determine what records are subject to such a request and whether or not any exemption to the disclosure of such records, or part thereof, is applicable. Contractor shall indemnify and defend the City from and against all claims arising from the City's exceptions to disclosing certain records which Contractor may designate as proprietary or confidential. Compliance by the City with an opinion or a directive from the Illinois Public Access Counselor or the Attorney General under FOIA, or with a decision or order of Court with jurisdiction over the City, shall not be a violation of this Section.

1.7 The Contractor shall obtain prior approval from the City prior to sub-contracting with any entity or person to perform any of the work required under this Agreement. The Contractor may, upon request of the City, submit to the City a draft sub-contractor agreement for City review and approval prior to the execution of such an agreement. Any previously entered into sub-contractor agreement(s) are attached as Exhibit C. If the Contractor sub-contracts any of the services to be performed under this Agreement, the sub-contractor agreement shall provide that the services to be performed under any such agreement shall not be sublet, sold, transferred, assigned or otherwise

disposed of to another entity or person without the City's prior written consent. The Contractor shall be responsible for the accuracy and quality of any sub-contractor's work.

1.8 The Contractor shall cooperate fully with the City, other City contractors, other municipalities and local government officials, public utility companies, and others, as may be directed by the City. This shall include attendance at meetings, discussions and hearings as requested by the City. This cooperation shall extend to any investigation, hearings or meetings convened or instituted by OSHA relative to this Project, as necessary. Contractor shall cooperate with the City in scheduling and performing its Work to avoid conflict, delay in or interference with the work of others, if any, at the Project.

1.9 The Contractor acknowledges that it shall enforce and comply with all applicable Occupational Safety and Health Administration standards (OSHA) for this Project in effect as of the date of the execution of this Agreement, or as otherwise promulgated by OSHA in the future taking effect during the pendency of this Project. Contractor shall enforce all such standards and ensure compliance thereto as to its own agents and employees, and as to the agents and employees of any sub-contractor throughout the course of this Project. Contractor is solely responsible for enforcing and complying with all applicable safety standards and requirements on this Project, and is solely responsible for correcting any practices or procedures which do not comply with the applicable safety standards and requirements for this Project. Any Project specific safety requirements applicable to this Project must be followed by Contractor and any sub-contractor(s) on the Project. Additionally, all such safety requirements shall be made a part of any sub-contractor agreement.

1.10 The Contractor shall submit to the City a progress report each month this Agreement is in effect. The report shall include the following items:

a) A summary of the Contractor's project activities, and any sub-contractor project activities that have taken place during the invoice period;
b) A summary of the Contractor's project activities and any sub-contractor project activities, that shall take place during the next invoice period;
c) A list of outstanding items due to or from the City; and
d) A status of the Project schedule.

1.11 The Contractor shall perform the work required under this Agreement pursuant to high quality industry standards expected by the City. The Contractor shall apply for and receive all appropriate permits before performing any work in the City. The Contractor shall also provide the appropriate permit drawings for Building Permits to be issued for the Project, if said permits are obligated by the Project. The City will assist the Contractor with obtaining the appropriate building and right-of-way permits.

1.12 The Contractor shall provide drawings of record, in the following 3 electronic formats for all locations where equipment has been installed and/or work has been performed. The electronic formats required by this Section 1.12 are Auto Cad Version 2023, ArcView and PDF.

1.13 Contractor recognizes that proper cleanup and removal of construction debris is an important safety consideration. The Contractor shall be solely responsible for daily construction site/area cleanup and removal of all construction debris in accordance with City-approved disposal practices. Contractor shall be solely responsible for identifying and removing at its expense all hazardous material and waste which it uses and generates.

1.14 To the extent that there is any conflict between a provision specified in this Agreement, with a provision specified in any of the other Contract Documents, as defined in Section 1.15, this Agreement shall control. The City and the Contractor may amend this Section 1.14 as provided by Section 15 herein.

The Contractor acknowledges and agrees that the City has no retained control over any of the Work done pursuant to this Agreement, and that the City is expressly exempt from the retained control exception as defined in the Restatement of Torts, Second, Section 414. This provision shall survive completion, expiration, or termination of this Agreement.

1.15 The Contract Documents for this Project consist of:

a) This Agreement;
b) The City's RFP/RFQ, and the plans, specifications, general conditions, drawings addenda, and modifications thereto;
c) The Contractor's response to the RFP/RFQ/Bid;
d) Other exhibits and schedules, if any, listed in this Agreement;
e) Amendments or Other Contract Documents, if any; and
f) Amendments/Modifications to this Agreement issued after execution thereof.

1.16 As a condition of receiving payment, Contractor must (i) be in compliance with the Agreement, (ii) pay its employees prevailing wages when required by law (Examples of prevailing wage categories include public works, printing, janitorial, window washing, building and grounds services, site technician services, natural resource services, security guard and food services). Contractor is responsible for contacting the Illinois Dept. of Labor 217-782-6206; http://www.illinois.gov/idol/Laws-Rules/CONMED/Pages/Rates.aspx to ensure compliance with prevailing wage requirements), (iii) pay its suppliers and sub-contractors according to the terms of their respective contracts, and (iv) provide lien waivers to the City upon request.

2 Standard Certifications

Contractor acknowledges and agrees that compliance with this section and each subsection for the term of the Agreement is a material requirement and condition of this Agreement. By executing this Agreement, Contractor certifies compliance with this section and each subsection and is under a continuing obligation to remain in compliance and report any non-compliance.

This section, and each subsection, applies to sub-contractors used on this Agreement. Contractor shall include these Standard Certifications in any sub-contract used in the performance of the Agreement.

If this Agreement extends over multiple fiscal years, Contractor and its sub-contractors shall confirm compliance with this section in the manner and format determined by the City by the date specified by the City and in no event later than January 1 of each year that this Agreement remains in effect.

If the City determines that any certification in this section is not applicable to this Agreement, it may be stricken, subject to sole approval by the City, without affecting the remaining subsections.

2.1 As part of each certification, Contractor acknowledges and agrees that should Contractor or its sub-contractors provide false information, or fail to be or remain in compliance with the Standard Certification requirements, one or more of the following sanctions will apply:

- the Agreement may be void by operation of law,
- the City may void the Agreement, and
- Contractor and its sub-contractors may be subject to one or more of the following: suspension, debarment, denial of payment, civil fine, or criminal penalty.

2.2 By signing this Agreement, the Contractor certifies that it has not been barred from being awarded a contract with a unit of State or local Government as a result of bid rigging or bid rotating or similar offense, nor has it made any admission of guilt of such conduct that is a matter of public record. (720 ILCS 5/33 E-3, E-4).

2.3 In the event of the Contractor's noncompliance with any provision of Section 1-12-5 of the Evanston City Code, the Illinois Human Rights Act or any other applicable law, the Consultant may be declared non-responsible and therefore ineligible for future contracts or sub-contracts with the City, and the contract may be cancelled or voided in whole or in part, and such other sanctions or penalties may be imposed or remedies invoked as provided by statute or regulation.

2.4 During the term of this Agreement, the Contractor agrees as follows:

a) That it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, marital status, national origin or ancestry, or age or physical or mental disabilities that do not impair ability to work, 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 underutilization. Consultant shall comply with all requirements of City of Evanston Code Section 1-12-5.

b) That, in all solicitations or advertisements for employees placed by it on its behalf, it will state that all applicants will be afforded equal opportunity without discrimination because of race, color, religion, sex, sexual orientation, marital status, national origin, ancestry, or disability.

2.5 The Contractor certifies pursuant to the Illinois Human Rights Act (775 ILCS 5/2*105*

et. seq.), that it has a written sexual harassment policy that includes, at a minimum, the following information:

a) The illegality of sexual harassment;
b) The definition of sexual harassment under State law;
c) A description of sexual harassment utilizing examples;
d) The Contractor's internal complaint process including penalties;
e) Legal recourse, investigation and complaint process available through the Illinois Department of Human Rights and the Human Rights Commission, and directions on how to contact both; and
f) Protection against retaliation as provided to the Department of Human Rights.

2.6 In accordance with the Steel Products Procurement Act (30 ILCS 565), Contractor certifies steel products used or supplied in the performance of a contract for public works shall be manufactured or produced in the U.S. unless the City grants an exemption.

2.7 Contractor certifies that it is properly formed and existing legal entity and as applicable has obtained an assumed name certificate from the appropriate authority, or has registered to conduct business in Illinois and is in good standing with the Illinois Secretary of State.

2.8 If Contractor, or any officer, director, partner, or other managerial agent of Contractor, has been convicted of a felony under the Sarbanes-Oxley Act of 2002, or a Class 3 or Class 2 felony under the Illinois Securities Law of 1953, Contractor certifies at least five years have passed since the date of the conviction.

2.9 Contractor certifies that if more favorable terms are granted by Contractor to any similar governmental entity in any state in a contemporaneous agreement let under the same or similar financial terms and circumstances for comparable supplies or services, the more favorable terms will be applicable under this Agreement.

2.10 Contractor certifies that it is not delinquent in the payment of any fees, fines, damages, or debts to the City of Evanston.

2.11 The Contractor certifies that all Design Professionals performing the Work under this Agreement will ensure that the Project shall be designed in conformance with the Americans with Disabilities Act of 1990, 42 U.S.C. Section 12101, *et seq.*, and all regulations promulgated thereunder. Design Professional means any individual, sole proprietorship, firm, partnership, joint venture, corporation, professional corporation, or other entity that offers services under the Illinois Architecture Practice Act of 1989 (225 ILCS 305/), the Professional Engineering Practice Act of 1989 (225 ILCS 325/), the Structural Engineering Licensing Act of 1989 (225 ILCS 340/), or the Illinois Professional Land Surveyor Act of 1989 (225 ILCS 330/).

2.12 The Contractor shall comply with all federal, state and local laws, statutes, ordinances, rules, regulations, orders or other legal requirements now in force or which may be in force during the term of this Agreement. The Contractor shall comply with the Illinois Human Rights

Act, 775 ILCS 5/1-101 *et. seq*, Title VII of the Civil Rights Act of 1964, and the Illinois Prevailing Wage Act, 820 ILCS 130/0.01 *et. seq.*

3 Additional Services/Change Orders

3.1 If the representative of the City responsible for the Project verbally requests the Contractor to perform additional services, the Contractor shall confirm in writing that the services have been requested and that such services are additional services. Failure of the City to respond to the Contractor's confirmation of said services within thirty (30) calendar days of receipt of the notice shall be deemed a rejection of, and refusal to pay for the additional services. Contractor shall not perform any additional services until City has confirmed approval of said additional services in writing. If authorized in writing by the City, the Contractor shall furnish, or obtain from others, additional services of the following types, which shall be paid for by the City as set forth in Section 9 of this Agreement:

a) Additional Services due to significant changes in scope of the Project or its design, including, but not limited to, changes in size, complexity or character of construction, or time delays for completion of work when such delays are beyond the control of the Contractor;
b) Revisions of previously approved studies, reports, design documents, drawings or specifications;
c) Preparation of detailed renderings, exhibits or scale models for the Project;
d) Investigations involving detailed consideration of operations, maintenance and overhead expenses for the preparation of rate schedules, earnings and expense statements, feasibility studies, appraisals and valuations, detailed quantity surveys of material and labor, and material audits or inventories required for certification of force account construction performed by the City;
e) Services not otherwise provided for in this Agreement.

3.2 The City may, upon written notice, and without invalidating this Agreement, require changes resulting in the revision or abandonment of work already performed by the Contractor, or require other elements of the work not originally contemplated and for which full compensation is not provided in any portion of this Agreement. Any additional services, abandonment of services which were authorized by the City, or changes in services directed by the City which result in the revision of the scope of services provided for in Exhibits A, B, C, and D that cause the total Compensation due Contractor under this Agreement to exceed $25,000 or more, or increase or decrease the contract duration by more than 30 days are subject to approval by the Evanston City Council. These actions must be addressed either in a written Change Order or in a written amendment to this Agreement approved by both parties.

3.3 Contractor acknowledges and agrees that the Public Works Construction Change Order Act, 50 ILCS 525/1 et seq. shall apply to all Change Orders for the Project. It is expressly understood and agreed to by Contractor that it shall not be entitled to any damages or Compensation from the City on account of delay or suspension of all or any part of the Work. Contractor acknowledges that delays are inherent in construction projects and Contractor assessed that risk and

fully included that risk assessment within its contract sum specified in its Response to the City Bid for this Project. The City shall not compensate Contractor for work that is more difficult than the contract sum specified in its Response would reflect. Delays to minor portions of the Work will not be eligible for extensions of time.

Delays to the Project caused by labor disputes or strikes involving trades not directly related to the Project, or involving trades not affecting the Project as a whole will not be eligible for an extension of time.

The City will not grant an extension of time for a delay by the Contractor's inability to obtain materials unless the Contractor first furnishes to the City documentary proof. The proof must be provided in a timely manner in accordance with the sequence of the Contractor's operations and accepted construction schedule.

In addition to any other changes requested by City (as described in Sections 3.1 and 3.2), the Company shall be entitled to request (and the City may grant) Change Orders with respect to:

(a) The City-caused delays;
(b) Change in Law;
(c) Force Majeure Events.

The foregoing events shall entitle the Contractor to a change in the Compensation for this Project, if the Contractor demonstrates that it will unavoidably incur reasonable costs as a result thereof and the Contractor provides reasonable and detailed documentary support with respect to any such price impact.

The parties agree to reasonably confer regarding any such disputes with respect to the issuance of a Change Order.

Any payment for compensable delay will only be based upon actual costs excluding, without limitation, what damages, if any, the Contractor may have reasonably avoided. The Contractor understands that this is the sole basis for recovering delay damages and explicitly waives any right to calculate daily damages for office overhead, profit, or other purported loss.

All Contractor Change Orders authorized under this Section 3 shall be made in writing. In remitting a Change Order, the Contractor must first show in writing that:

(a) The work was outside the scope of this Agreement,
(b) The extra work was not made necessary due to any fault of Contractor;
(c) The circumstances said to necessitate the change in performance were not reasonably foreseeable at the time the Agreement was signed;
(d) The change is germane to the original Agreement; and
(e) The Change Order is in the best interest of the City and authorized by law.

Any person who fails to first obtain the City's written authorization for a Change Order commits a Class 4 felony. The written determination and the written Change Order resulting from that determination shall be preserved in the contract's file which shall be open to the public for inspection.

The City reserves all rights and causes of action, at law or equity, to seek redress against entities or persons who violate the requirements of this Section 3. By initialing below, Contractor hereby acknowledges that it is bound by this Section 3.

Contractor's Initials: _____

3.4 The Contractor is required to include the City of Evanston as a reference whenever and wherever the Contractor provides references for similar projects for a period of one (1) year from the date of Final Acceptance by the City of the Work for this Project.

4 Bonds

4.1 Before the Scheduled Construction Commencement Date, the Contractor is required to furnish unconditional performance and payment bonds in the amount of 100% of the Compensation as security for the faithful performance and completion of all the Contractor's obligations under the Contract Documents and covering the payment of all materials used in the performance of this Agreement and for all labor and services performed under this Agreement. All Bonds shall be issued on a form acceptable to the City. The bonds must be for the entire term of the Agreement. Failure to provide these bonds shall constitute a breach of Contractor's obligations under this Agreement. Each surety providing the Bonds must have a Best's rating not less than A/X and be licensed in Illinois and shall be named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 as published in the Federal Register and available on the website of the U.S. Department of the Treasury, Financial Management Service, at www.fms.treas.gov/c570/c570.html. All Bonds signed by an agent must be accompanied by a certified copy of his or her authority to act. It shall be the duty of the Contractor to advise the surety or sureties of any Change Orders that result in an increase to the Compensation and to ensure that the amounts of the Bonds are updated to reflect and cover any such increases throughout the course of the Project. The cost of such Bonds shall be included within the Compensation.

4.2 If the surety behind any Bond furnished by the Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in the State or it ceases to meet any of the requirements of this Contract, the Contractor shall, within [5] five days thereafter, substitute another Bond of equivalent value and surety, both of which must be acceptable to the City. In addition, no further progress payments under the Agreement will be made by the City until the Contractor complies with the provisions of this Agreement. The Contractor shall furnish to the City proof of any required bonds and proof of required insurance as one of the conditions precedent to payment under the Agreement. Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment or performance of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or authorize a copy to be furnished. All surety Bonds

provided for in this Section shall incorporate by reference this Agreement, and any language that may be in any such surety Bond which conflicts with the provisions of this Agreement that define the scope of the surety('s) duty(ies) shall be of no force and effect.

5 Liquidated Damages in the Event Contractor Fails to Complete the Work

5.1 The parties agree that failure of Contractor to timely complete the Work required by this Agreement constitutes a default. The parties agree that this default will result in damage and injury to City. The parties further agree, however, that actual damages incurred by City as result of such default is difficult if not impossible to ascertain with any degree of certainty or accuracy. Accordingly, the parties have negotiated and have agreed that for each calendar day after written notice is delivered to Contractor and Contractor fails to cure such default, that Contractor will pay City, as and for liquidated damages, and not as a penalty, a sum in the amount as specified in Section 108.09 of the IDOT Standard Specifications per calendar day. Contractor shall reimburse the City for all costs, expenses and fees (including, without limitation, attorneys' fees), if any, paid by the City in connection with such written demand by City. Contractor stipulates and agrees that the sums payable by Contractor under this Section are reasonable under the circumstances existing as of the execution of this Agreement. This Section 5.1 is not intended to limit any direct damages that may be recoverable by City related to the Contractor's failure to complete the Work in accordance with this Agreement. There shall be no early completion bonus if the Work is completed before the contract's deadlines. The City, at its option, may withhold liquidated damages from progress payments payable to Contractor before project completion.

6 The City's Responsibilities

6.1 The City may evaluate the Contractor's and any sub-contractor's performance (interim and final). Timeliness in meeting the Project schedule and the overall relationship with the Contractor are factors that will be considered in the Contractor's performance rating. An unfavorable performance rating may be a factor when future assignments are being considered.

6.2 The City makes no representation or warranty of any nature whatsoever as to the accuracy of information or documentation provided by the City to the Contractor which were generated or provided by third parties.

7 Period of Service

7.1 The Contractor shall commence work on the Project after supplying the City with the Contractor's performance and payment bonds and all required insurance documents before starting its Work on this Project. The City shall determine when the Contractor has completed the Work required pursuant to this Agreement, and shall determine the date of Final Acceptance. Contractor recognizes time is of the essence regarding its performance on this Project. Contractor shall continue to perform its obligations while any dispute concerning the Agreement is being resolved, unless otherwise directed by the City.

7.2 Each phase of the project shall be completed in accordance with the activities outlined in the City's Bid 23-58, Exhibit A.

8 Payment for Services and Reimbursements

8.1 Within the first five (5) business days of each month, the Contractor shall invoice the City for Work completed during the previous month. The Contractor shall provide a detailed invoice that relates invoiced items to the Contractor's response to Bid 23-58 in both quantity and unit cost. Any discrepancies in the monthly invoice shall be promptly brought to the attention of the Contractor by the City Project Manager and efforts shall be made to promptly resolve said discrepancies between the City and Contractor. In the event the City and Contractor cannot resolve invoice discrepancies, items in dispute will be removed from the invoice and the City shall approve the remainder of the invoice. Payment will be made as soon as possible following the City Council meeting in which the item appeared on the bills list, and in accordance with all applicable laws and rules of the City of Evanston and the State of Illinois.

8.2 In the event of termination by the City of this Agreement pursuant to paragraph 9.1 after completion of any phase of the basic services, fees due the Contractor for services rendered through such phase shall constitute final payment for such services, and no further fees shall be due to the Contractor. In the event of such termination by the City during any phase of the basic services, the Contractor shall be paid for services rendered on the basis of the proportion of work completed on the phase to date of termination.

8.3 The City shall have the right to withhold payment to the Contractor due to the quality of a portion or all of the work performed hereunder which is not in accordance with the requirements of this Agreement, or which is unsatisfactory, or is due to the Contractor's failure or refusal to perform any of its obligations hereunder. Compensation in excess of the total contract amount specified in this Agreement will not be allowed unless justified in the City's sole judgment and authorized in advance as provided for in Section 3 of this Agreement. Compensation for improper performance by the Contractor is disallowed.

8.4 Upon completion of the Work performed by the Contractor, prior to the submission of a request for final payment, the City and Contractor shall perform a final acceptance test and review of the Work performed and/or equipment installed pursuant to the Agreement. A punch list of items outstanding will be jointly developed by the City and Contractor. In addition, the Contractor shall submit drawings of record for the Project for the City to approve. The Contractor shall promptly resolve all punch list items to the satisfaction of the City, and shall transmit to the City in writing confirmation that all punch list items have been resolved. The City will review, and the Contractor shall modify, as necessary, any drawings of record to the satisfaction of the City. Punch list items and drawings of record must be approved by the City prior to the Contractor submitting its final invoice for payment.

8.5 The Contractor shall submit an Affidavit and a final waiver of its lien, and all final waivers of liens of any sub-contractors, suppliers, and sub-sub-contractors, if applicable, with its

final invoice, stating that all obligations incurred in performance of the professional services have been paid in full. The Affidavit will also include a statement stating that the professional services were performed in compliance with the terms of the Agreement. The Affidavit and all final lien waivers shall be on a form acceptable to the City.

8.6 All Project invoices shall be sent to:

City of Evanston
Public Works Agency
2100 Ridge Avenue
Evanston, Illinois 60201

9 Notice and Cure/Termination

9.1 In furtherance of Contractor's Work on this Project, the City and the Contractor agree that the following Notice and Cure provision in this Section 9.1 shall apply during the duration of Contractor's work on this Project, in addition to the reserved rights of the City enumerated in this Agreement as follows:

5.1 Liquidated Damages;
8.3 City's right to withhold payment;
16.2 Contractor's duty to revise and correct errors; and
16.3 Contractor's duty to respond to City's notice of errors and omissions.

The City may notify Contractor of its intent to terminate this Agreement within (7) seven calendar days of issuance by the City of written notice to Contractor's Project Manager regarding defects in the Project or in Contractor's Work. The City shall specify any such nonconforming Work or defects in the Project in its notice to Contractor under this Section 9.1. Contractor will have the opportunity to cure the non-conforming Work within (7) seven calendar days after receipt of the written notice issued by the City. All such curative work done shall be performed and completed to the City's satisfaction. Nothing in this Section 9.1 shall otherwise affect the City's right to exercise its rights in Section 9.2.

9.2 The City shall have the right to terminate this Agreement upon fifteen (15) days written notice for any reason. Mailing of such notice shall be equivalent to personal notice and shall be deemed to have been given at the time of receipt.

Payments made by the City pursuant to this Agreement are subject to sufficient appropriations made by the City of Evanston City Council. In the event of termination resulting from non-appropriation or insufficient appropriation by the City Council, the City's obligations hereunder shall cease and there shall be no penalty or further payment required.

9.3 Within thirty (30) days of termination of this Agreement, the Contractor shall turn over to the City any documents, drafts, and materials, including but not limited to, outstanding work product, data, studies, test results, source documents, AutoCAD Version 2007, ArcView, PDF,

Word, Excel spreadsheets, technical specifications and calculations, and any other such items specifically identified by the City related to the Work herein. Upon receipt of said items, the Contractor shall be paid for labor and expenses incurred to the date of termination as provided in Section 8.2. This Agreement is subject to termination by either party if either party is restrained by a state or federal court of competent jurisdiction from performing the provisions of this Agreement. Upon such termination, the liabilities of the parties to this Agreement shall cease, but they shall not be relieved of the duty to perform their obligations through the date of termination. No lien shall be filed by the Contractor in the event of a termination of this Agreement by the City.

9.4 If, because of death or any other occurrence, including, but not limited to, Contractor becoming insolvent, it becomes impossible for any principal or principals of the Contractor to render the services set forth in this Agreement, neither the Contractor, nor its surviving principals shall be relieved of their obligations to complete the professional services. However, in the event of such an occurrence, the City at its own option may terminate this Agreement if it is not furnished evidence that competent professional services can still be furnished as scheduled.

9.5 In the event of an emergency or threat to the life, safety or welfare of the citizens of the City, the City shall have the right to terminate this Agreement without prior written notice.

10 Insurance

10.1 The Contractor shall, at its own expense, secure and maintain in effect throughout the duration of this contract, insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the Work hereunder by the Contractor, its agents, representatives, employees or sub-contractors. Contractor acknowledges and agrees that if it fails to comply with all requirements of this Section 10, the City may void the Agreement.

The Contractor must give to the City Certificates of Insurance identifying the City to be an Additional Insured for all Work done pursuant to this Agreement before City staff recommends award of the contract to City Council. Any limitations or modifications on the Certificate(s) of Insurance issued to the City in compliance with this Section that conflict with the provisions of this Section 10 shall have no force and effect.

After award of the Contract to Contractor (contracts over $500,000 in value or if the project is deemed high risk) the Contractor **shall** give the City a certified copy (ies) of the insurance policy (ies) evidencing the amounts set forth in Section 10.2, and copies of the Additional Insured endorsement to such policy (ies) which name the City as an Additional Insured for all Work done pursuant to this Agreement before Contractor does any Work pursuant to this Agreement. Contractor's certificate of insurance shall contain a provision that the coverage afforded under the policy(s) will not be canceled or reduced without thirty (30) days prior written notice (hand delivered or registered mail) to the City. Contractor shall promptly forward new certificate(s) of insurance evidencing the coverage(s) required herein upon annual renewal of the subject policies.

The policies and the Additional Insured endorsement must be delivered to the City within

two (2) weeks of the request. All insurance policies shall be written with insurance companies licensed or authorized to do business in the State of Illinois and having a rating of not less than A-VII according to the A.M. Best Company. Should any of the insurance policies be canceled before the expiration date, the issuing company will mail thirty (30) days written notice to the City. The Contractor shall require and verify that all sub-contractors maintain insurance meeting all of the requirements stated herein.

Any deductibles or self-insured retentions must be declared to and approved by the City. At the option of the City, either the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the City, its officers, officials, employees and volunteers; or the Contractor shall provide a financial guarantee satisfactory to the City guaranteeing payment of losses and related investigations, claim administration and defense expenses.

10.2 Contractor shall carry and maintain at its own cost with such companies as are reasonably acceptable to City all necessary liability insurance (which shall include as a minimum the requirements set forth below) during the term of this Agreement, for damages caused or contributed to by Contractor, and insuring Contractor against claims which may arise out of or result from Contractor's performance or failure to perform the Services hereunder:

a) Worker's compensation in statutory limits and employer's liability insurance in the amount of at least five hundred thousand dollars ($500,000);
b) Comprehensive general liability coverage which designates the City as an additional insured for not less than three million dollars ($3,000,000) combined single limit for bodily injury, death and property damage, per occurrence;
c) Comprehensive automobile liability insurance covering owned, non-owned, and leased vehicles for not less than one million dollars ($1,000,000) combined single limit for bodily injury, death, or property damage, per occurrence; and

Contractor understands that the acceptance of Certificates of Insurance, policies, and any other documents by the City in no way releases the Contractor and its sub-contractors from the requirements set forth herein.

Contractor expressly agrees to waive its rights, benefits and entitlements under the "Other Insurance" clause of its commercial general liability insurance policy as respects the City. Contractor expressly agrees that its insurance coverage is required to be primary by this Agreement, that its insurance coverage shall be on a primary and non-contributory basis, and that it and its insurance carrier are estopped from denying such coverage is primary. In the event Contractor fails to purchase or procure insurance as required above, the parties expressly agree that Contractor shall be in default under this Agreement, and that the City may recover all losses, attorney's fees and costs expended in pursuing a remedy, or reimbursement, at law or in equity, against Contractor.

11 Indemnification

11.1 The Contractor shall defend, indemnify and hold harmless the City and its officers, elected and appointed officials, agents, and employees from any and all liability, losses, or damages

as a result of claims, demands, suits, actions, or proceedings of any kind or nature, including but not limited to costs, and fees, including attorney's fees, judgments or settlements, resulting from or arising out of any negligent or willful act or omission on the part of the Contractor or Contractor's sub-contractors, employees, agents or sub-contractors during the performance of this Agreement. Such indemnification shall not be limited by reason of the enumeration of any insurance coverage herein provided. This provision shall survive completion, expiration, or termination of this Agreement.

11.2 Nothing contained herein shall be construed as prohibiting the City, or its officers, agents, or employees, from defending through the selection and use of their own agents, attorneys, and experts, any claims, actions or suits brought against them. The Contractor shall be liable for the costs, fees, and expenses incurred in the defense of any such claims, actions, or suits. Nothing herein shall be construed as a limitation or waiver of defenses available to the City and employees and agents, including but not limited to the Illinois Local Governmental and Governmental Employees Tort Immunity Act, 745 ILCS 10/1-101 *et seq.*

At the City Corporation Counsel's option, Contractor must defend all suits brought upon all such Losses and must pay all costs and expenses incidental to them, but the City has the right, at its option, to participate, at its own cost, in the defense of any suit, without relieving Contractor of any of its obligations under this Agreement. Any settlement of any claim or suit related to this Project by Contractor must be made only with the prior written consent of the City Corporation Counsel, if the settlement requires any action on the part of the City.

To the extent permissible by law, Contractor waives any limits to the amount of its obligations to indemnify, defend, or contribute to any sums due under any Losses, including any claim by any employee of Contractor that may be subject to the Illinois Workers Compensation Act, 820 ILCS 305/1 *et seq.* or any other related law or judicial decision, including but not limited to, *Kotecki v. Cyclops Welding Corporation,* 146 Ill. 2d 155 (1991). The City, however, does not waive any limitations it may have on its liability under the Illinois Workers Compensation Act, the Illinois Pension Code or any other statute.

11.3 The Contractor shall be responsible for any losses and costs to repair or remedy work performed under this Agreement resulting from or arising out of any act or omission, neglect, or misconduct in the performance of its Work or its sub-contractors' work. Acceptance of the work by the City will not relieve the Contractor of the responsibility for subsequent correction of any such error, omissions and/or negligent acts or of its liability for loss or damage resulting therefrom.

11.4 All provisions of this Section 11 shall survive completion, expiration, or termination of this Agreement.

12 Drawings and Documents

12.1 Any drawings, survey data, reports, studies, specifications, estimates, maps, plans, computations, and other documents required to be prepared by the Contractor for the Project shall be considered Works for Hire and the sole property of the City.

12.2 The Contractor and its sub-contractor shall maintain for a minimum of three (3) years after the completion of this Agreement, or for three (3) years after the termination of this Agreement, whichever comes later, adequate books, records and supporting documents to verify the amounts, recipients and uses of all disbursements of funds passing in conjunction with the Agreement. The Agreement and all books, records and supporting documents related to the Agreement shall be available for review and audit by the City and the federal funding entity, if applicable, and the Contractor agrees to cooperate fully with any audit conducted by the City and to provide full access to all materials. Failure to maintain the books, records and supporting documents required by this Subsection shall establish a presumption in favor of the City for recovery of any funds paid by the City under the Agreement for which adequate books, records, and supporting documentation are not available to support their purported disbursement.

13 Successors and Assigns

13.1 The City and the Contractor each bind themselves and their partners, successors, executors, administrators, and assigns to the other party of the Agreement and to the partners, successors, executors, administrators, and assigns of such other party in respect to all covenants of this Agreement. Neither the City nor the Contractor shall assign, sublet, or transfer its interest in this Agreement without the written consent of the other. Nothing herein shall be construed as creating any personal liability on the part of any officer or agent of any public body, which may be a party hereto, nor shall it be construed as giving any right or benefits hereunder to anyone other than the City and the Contractor.

14 Force Majeure

14.1 Whenever a period of time is provided for in this Agreement for the Contractor or the City to do or perform any act or obligation, neither party shall be liable for any delays or inability to perform if such delay is due to a cause beyond its control and without its fault or negligence including, without limitation:

a) Acts of nature;
b) Acts or failure to act on the part of any governmental authority other than the City or Contractor, including, but not limited to, enactment of laws, rules, regulations, codes or ordinances subsequent to the date of this Agreement;
c) Acts or war;
d) Acts of civil or military authority;
e) Embargoes;
f) Work stoppages, strikes, lockouts, or labor disputes;
g) Public disorders, civil violence, or disobedience;
h) Riots, blockades, sabotage, insurrection, or rebellion;
i) Epidemics or pandemics;
j) Terrorist acts;
k) Fires or explosions;
l) Nuclear accidents;
m) Earthquakes, floods, hurricanes, tornadoes, or other similar calamities;

n) Major environmental disturbances; or
o) Vandalism.

If a delay is caused by any of the *force majeure* circumstances set forth above, the time period shall be extended for only the actual amount of time said party is so delayed. Further, either party claiming a delay due to an event of *force majeure* shall give the other party written notice of such event within three (3) business days of its occurrence or it shall be deemed to be waived.

15 Amendments and Modifications

15.1 Except as otherwise provided herein, the nature and scope of Work specified in this Agreement may only be modified by a written Change Order, or a written amendment to this Agreement, approved by both parties. This Agreement may be modified or amended from time to time provided, however, that no such amendment or modifications shall be effective unless reduced to writing and duly authorized and signed by the authorized representatives of the parties.

16 Standard of Care & Warranty

16.1 The Contractor shall perform all of the provisions of this Agreement to the satisfaction of the City. The City shall base its determination of the Contractor's fulfillment of the scope of the work in accordance with generally accepted professional standards applicable to the Work for this Project. The Contractor shall perform all of the provisions of this Agreement with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar conditions.

16.2 The Contractor shall be responsible for the accuracy of its professional services under this Agreement and shall promptly make revisions or corrections resulting from its errors, omissions, or negligent acts without additional compensation. The City's acceptance of any of the Contractor's professional services shall not relieve the Contractor of its responsibility to subsequently correct any such errors or omissions. If a Contractor has provided the City with specifications for this Project which are determined to be incorrect or which require revision during the solicitation process (including but not limited to Requests for Proposals, Requests for Qualifications, or bids), the Contractor shall make such corrections or revisions to the specifications at no cost to the City. Further, upon receipt of an invoice from the City, the Contractor shall promptly reimburse the City for the reasonable costs associated with the preparation and dissemination of said corrections or revisions to appropriate parties, including but not limited to preparation of the corrected or revised documents, and printing and distribution costs.

16.3 During the pendency of its Work on this Project, the Contractor shall respond to the City's notice of any errors or omissions within twenty-four (24) hours. The Contractor shall be required to promptly visit the Project site(s) if directed to by the City.

16.4 The Contractor shall comply with all federal, state, and local statutes, regulations, rules, ordinances, judicial decisions, and administrative rulings applicable to its performance under

this Agreement.

16.5 Contractor guarantees and warrants to the City that:

a) All materials and equipment furnished under this Agreement shall be of good quality and new, unless otherwise required or permitted by the Contract Documents;
b) The Work of this Agreement shall be free from defects which are not inherent in the quality required; and
c) The Work shall comply with the requirements set forth in the Contract Documents.

This warranty and guarantee shall be for a period of one (1) year from the date of completion and Final Acceptance of the Work by the City, or as otherwise provided in the Contract Documents.

If, within the one year warranty period, after the Contractor has received a final payment under this Agreement, any of the Work is found to be not be in accordance with the requirements of this Agreement, or where defects in materials or workmanship may appear, or be in need of repair, the Contractor shall correct non-conforming and/or defective work or materials promptly after receipt of written notice from the City. Contractor shall immediately at its own expense repair, replace, restore, or rebuild any such Work. This remedy is in addition to any other legal or equitable remedies the City may have under this Agreement or the law.

This guarantee and warranty shall not relieve Contractor of liability for latent defects, and shall be in addition to the City's rights under the law or other guarantees or warranties, express or implied.

16.6 The provisions of this Section 16 shall survive the completion, expiration or termination of this Agreement.

17 Savings Clause

17.1 If any provision of this Agreement, or the application of such provision, shall be rendered or declared invalid by a court of competent jurisdiction, or by reason of its requiring any steps, actions, or results, the remaining parts or portions of this Agreement shall remain in full force and effect.

18 Non-Waiver of Rights

18.1 No failure or delay by the City to exercise any power given to it hereunder or to insist upon strict compliance by Contractor with its obligations hereunder, nor any payment made by the City under this Agreement, shall constitute a waiver of the City's right to demand strict compliance with the terms hereof, unless such waiver is in writing and signed by the City.

19 Entire Agreement

19.1 This Agreement sets forth all the covenants, conditions and promises between the

parties with regard to the subject matter set forth herein. There are no covenants, promises, agreements, conditions or understandings between the parties, either oral or written, other than those contained in this Agreement. This Agreement has been negotiated and entered into by each party with the opportunity to consult with its counsel regarding the terms therein. No portion of the Agreement shall be construed against a party due to the fact that one party drafted that particular portion as the rule of *contra proferentem* shall not apply.

20 Governing Law

20.1 This Agreement shall be construed in accordance with and subject to the laws and rules of the City of Evanston and the State of Illinois both as to interpretation and performance. Venue for any action arising out of or due to this Agreement shall be in Cook County, Illinois. The City shall not enter into binding arbitration to resolve any dispute related to this Agreement. The City does not waive tort immunity by entering into this Agreement.

21 Ownership of Contract Documents

21.1 Contractor is specifically prohibited from using in any form or medium, the name or logo of the City for public advertisement, unless expressly granted written permission by the City. Submission or distribution of documents to meet official regulatory requirements or for similar purposes in connection with this Project is not to be construed as publication in derogation of the City's reserved rights.

22 Notice

22.1 Any notice required to be given by this Agreement shall be deemed sufficient if made in writing and sent by certified mail, return receipt requested, or by personal service, to the persons and addresses indicated below or to such other addresses as either party hereto shall notify the other party of in writing pursuant to the provisions of this Subsection:

City of Evanston Project Manager, Bid 23-58
2100 Ridge Avenue
Evanston, Illinois 60201

if to the Contractor:

_____
_____
_____

22.2 Mailing of such notice as and when provided above shall be equivalent to personal notice and shall be deemed to have been given at the time of mailing.

23 Severability

23.1 Except as otherwise provided herein, the invalidity or unenforceability of any

particular provision, or part thereof, of this Agreement shall not affect the other provisions, and this Agreement shall continue in all respects as if such invalid or unenforceable provision had not been contained herein.

24 Execution of Agreement

24.1 This Agreement shall be signed last by the City Manager.

25 Counterparts

25.1 For convenience, this Agreement may be executed in any number of counterparts, each of which shall be deemed to be an original.

26 Authorizations

26.1 The Contractor's authorized representatives who have executed this Agreement warrant that they have been lawfully authorized by the Contractor's board of directors or its bylaws to execute this Agreement on its behalf. The City Manager affirms that he/she has been lawfully authorized to execute this Agreement. The Contractor and the City shall deliver upon request to each other copies of all articles of incorporation, bylaws, resolutions, ordinances, or other documents which evidence their legal authority to execute this Agreement on behalf of their respective parties.

27 Time of Essence

27.1 Time is of the essence with respect to each provision hereof in which time is a factor.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be signed by their duly authorized representatives. The effective date of this Agreement will be the date this Agreement is signed by the City Manager.

CONTRACTOR

By: _____

Name: _____

Its: _____

Date: _____

CITY OF EVANSTON

By: _____
Luke Stowe
Its: City Manager Date: _____

Approved as to form:

By: _____
Alexandra Ruggie
Its: Interim Corporation Counsel

Revision: April 2021

EXHIBIT N

EXHIBIT O

BID BOND SUBMITTAL LABEL

CUT AND ATTACH LABEL ON OUTSIDE OF SEALED BID BOND SUBMITTAL

✂----------

BID SUBMITTAL NUMBER: _____

BID SUBMITTAL NAME: _____

_____

BID SUBMITTAL DUE DATE/TIME: _____

COMPANY NAME: _____

COMPANY ADDRESS: _____

COMPANY TELEPHONE #: _____

✂----------

If required by the bid documents, a scanned copy of the bid bond must be included with the bid electronic submission. The City is currently not able to accept a certified check, bank cashier's check or electronic bid bond at this time.

The original bid bond (in the amount of 5% of the original bid amount) must be mailed within ten (10) days after the bid due date, to the City of Evanston Purchasing Department, 2100 Ridge Avenue - Room 4200 Evanston, Illinois 60201 Attention Purchasing Manager using the USPS (certified or priority), UPS or FedEx mail options in order to have a tracking number; which sum shall be forfeited in case the successful bidder fails to enter into a binding contract and provide a properly executed contract and surety bond within 15 days after the date the contract is awarded by the City.

SECTION 01 00 00

PROJECT REQUIREMENTS

PART 1 – GENERAL

1.1 GENERAL NOTE

A. The following requirements are a component part of all contract divisions and form a part of each specification section in so far as they may be in any way applicable thereto.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this section.

1.3 SCHEDULE OF DRAWINGS

A. The following drawings form a component part of all contract documents for this project.

Title of the Drawings:

Sheet No.	Drawing No.	Drawing Title
--	-	Cover Sheet
1	G01	Drawing Index, Location Map, Notes and Abbreviations/
2	G02	Construction Constraints
3	C01	Symbol Legend
4	C02	Grading and Restoration Plan
5	C03	Yard Piping Plans – Demolition and New Work
6	C04	Details
7	S01	General Structural Notes
8	S02	General Structural Notes and Schedules
9	S03	Structural Foundation Plan
10	S04	Structural Foundation Details
11	M01	Symbol Legend
12	M02	Mechanical Plan – Demolition
13	M03	Mechanical Plan – New Work
14	M04	Diagrams
15	M05	Schedules and Sections
16	M06	Details
17	E01	Electrical Notes, Symbols and Abbreviations
18	E02	Electrical Demolition Plan
19	E03	Electrical Power Plan
20	E04	Electrical Schedules and Single Line Diagram

1.4 PROJECT SUMMARY

A. Work on this project includes:
1. Replacement and reorientation of the north fuel island while maintaining full functionality of the south fuel island.
2. Modification of the tank size and fuel types at the new north island to one 15,000 gallon diesel fuel tank and one 15,000 gallon unleaded fuel tank.
3. Providing a new canopy to better protect the island's fueling equipment and users.
4. Adding a new 40 kW generator and associated electrical panel and components to provide backup power for the new north fuel island. An existing 12.5 kW generator currently provides backup power to the existing north fuel island. The

existing north fuel island will need to be disconnected from the existing the 12.5 kW generator.

5 Replacing the existing fuel dispensing system with a new modernized system that manages and tracks fuel consumption.

5.1 SPECIAL PROCEDURES AND REQUIREMENTS

A. Fire Protection

1. Regulations: The Contractor shall comply with all federal, state and local fire regulations.
2. Fires: The Contractor shall prohibit the lighting of fires about the premises and use due diligence to see that such prohibition is enforced. Debris and waste materials shall not be burned at the construction site but shall be promptly removed to prevent the accumulation of combustibles on the site.
3. Smoking: Smoking shall be restricted to designated exterior locations. The Contractor shall furnish and post “NO SMOKING” signs at appropriate locations throughout the site where operations are conducted.
4. Flammables: Gasoline and other fuels shall be kept and handled from National Board of Fire underwriter’s approved safety cans and shall be stored away from hazardous work areas.

B. Limit of Contractor’s Operations

1. Work Areas: Work areas shall be confined to the limits of the construction site. The allotment of work areas within the site to Subcontractors shall be made by the Contractor. The general scheme of operations, work area assignments and use of the job site shall be subject to the Owner’s approval.
2. Site Access: Uncontrolled or unrestricted site access will not be permitted for materials, debris or equipment. All access routes and methods shall be controlled by the Contractor so as to minimize the disruption of the Owner’s operations and shall be subject to approval by the Owner. Walks, roads and other existing site features used in moving materials shall be properly protected to prevent damage thereto.

C. Hoists, Scaffolds and Ladders

1. Hoists: The Contractor shall furnish, erect, operate and maintain suitable hoisting equipment as may be necessary for constructing the work. Material hoists shall be constructed and maintained in accordance with all applicable federal, state and local laws, regulations and ordinances. Location of hoists shall be subject to approval by the Owner’s representative.
2. Scaffolds and Ladders: The Contractor shall furnish, erect, maintain and move all scaffold and ladders required for his work. Scaffolds shall be constructed and maintained in accordance with all applicable federal, state and local laws, regulations and ordinances. Scaffolds and ladders shall be promptly removed after their purpose has been served.

D. Documentation of Existing Conditions

1. Before starting any work, the Contractor shall examine the site to be worked on and the grounds in the staging area and areas adjacent to the site that will be worked on for any existing damage. The Contractor should notify the City’s representative of any damage found immediately. The City will photograph and note any existing damage that has been brought to his attention by the

Contractor. After the Work has been completed the City will inspect the area used by the Contractor. If any damage is found that was not reported previously, this damage would be considered to have been done by the Contractor. The cost to repair said damage shall be solely borne by the Contractor.

5.2 TEMPORARY CONSTRUCTION FACILITIES

A. The following temporary utilities and facilities on the construction site shall be provided by the party indicated below:

ITEM	PROVIDER
Telephone	General Contractor
Electricity	City
Water	City
Toilets	General Contractor
Parking spaces for Contractor vehicles	Parking lot at 2100 Ridge Avenue
Parking spaces for workmen	Parking lot at 2100 Ridge Avenue
Storage areas & facilities	Limited unsecured space within job site
Temporary heat	General Contractor
Job-site trailers & offices	General Contractor

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 00 00

SECTION 01 01 00

SUMMARY OF WORK

PART 1 – GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. The Project Manual and accompanying drawings are intended to cover the work necessary to construct the various headings of work as described in detail herein.

B. The work to be performed under this contract shall consist of the furnishing of all materials, equipment, supplies, labor and transportation, and performing all work as required to strictly conform to the provisions of the specifications, schedules and drawings, all of which are made a part herein, together with such detail drawings as may be furnished by the Owner from time to time during the prosecution of the work in amplification of said drawings and specifications.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this section.

1.3 CONTRACT ORGANIZATION

A. This Construction Project is organized under a single contract between the Owner and the Contractor. The Contractor is responsible for all plans and specification sections as presented in this project manual.

1.4 WORK SEQUENCE

A. All work and sequence of operations shall be as scheduled in conjunction with all subcontractors, and the Owner in such a manner as not to hinder or delay any other contractors in the progress of their work, and to an end that will expedite the work to completion at the earliest possible date.

B. Both Contractor and Subcontractor shall cooperate to execute their work as scheduled to minimize the delays to each other and to cause the least inconvenience to the Owner and the public.

1.5 CONTRACTORS' USE OF PREMISES

A. The Contract shall limit his use of the premises for work and for storage to allow for:
   1. Work by other contractors
   2. Owner occupancy

B. Coordinate the use of the premises under direction of the Owner. Stage work so as to avoid disruption to Owner's operation.

C. Assume full responsibility for the protection and safekeeping of products under this Contract, which are stored at the project site or on the Contractor's property.

D. Move any stored products, under Contractor's control, which interfere with operation of the Owner or separate contractor.

E. Obtain and pay for the use of additional storage or work areas needed for operations.

1.6 OWNER OCCUPANCY

A. The City will maintain 24 hour access to all areas of the property at all times.

B. Contractor shall not utilize or prevent access to existing utility easement areas during the entire construction period.

1.7 LINES, LEVELS AND LAYOUT OF WORK

A. The Contractor shall establish and guarantee all lines, levels, etc. called for on the drawings, including the lines, levels, etc. of all Subcontractors.

1.8 DESCRIPTION OF SITE

A. The site is the north yard of the City of Evanston's Service Center located at 2020 Asbury Avenue, Evanston, Illinois 60201.

1.9 WORK HOURS

A. Work hours are 7:00 am to 7:00 pm, Monday through Friday and 8:00 am to 5:00 pm on Saturday. No work is allowed on Sundays. Access to the site will not be allowed outside of normal work hours.

1.10 CONTRACTOR'S DUTIES

A. Except as specifically noted, provide and pay for:

1. Labor, materials and equipment.
2. Tools, construction equipment and machinery
3. Water, heat, and utilities required for construction or the Contractor's operations.
4. Other facilities and services necessary for proper execution and completion of work, including traffic control and temporary work.

B. Promptly submit written notice to the Engineer of any observed variance of the Contract Documents from legal requirements. It is not the Contractor's responsibility to make certain that the Drawings and Specifications comply with codes and regulations.

1. Appropriate modifications to the Contract Documents will adjust the necessary changes.
2. The Contractor shall assume responsibility for work known to be contrary to such requirements, and performed without such notice.

C. Enforce strict discipline and good order among employees. Do not employ on work:

1. Unfit persons

2. Persons not skilled in assigned task

D. Existing Conditions

1. The Contractor shall be responsible for obtaining and verifying all dimensions. Any dimension give in the Drawings referring to existing construction were taken from the original construction documents and are provided for information only.
2. Where conditions are uncovered that are not anticipated by the Drawings and Specifications, the Contractor shall notify the Engineer and Owner's Representative immediately, before any modification or other work is initiated.

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 01 00

SECTION 01 02 70

APPLICATIONS FOR PAYMENT

PART 1 – GENERAL

1.1 SUMMARY

A. Contractor shall comply with procedures described in this Section when applying for progress payments and final payment under the Contract.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

B. Payments upon Substantial Completion and Completion of the Work are described in Section 01 70 00 – PROJECT CLOSEOUT.

C. The Owner's approval of applications for progress payment and final payment may be contingent upon the Owner's approval of status of Project Record Documents as described in Section 01 72 00 – PROJECT RECORD DOCUMENTS of these Specifications.

1.3 QUALITY ASSURANCE

A. Prior to start of construction, secure the Owner's approval of the schedule of values required to be submitted as specified below.

B. During progress of the Work, modify the schedule of values as approved by the Owner to reflect changes in the Contract Sum due to Change Orders or other modifications of the Contract.

C. All requests for payment shall be based on the approved Schedule of Values for the project.

D. All modifications to the contract shall be based on the approved Schedule of Values for the project.

1.4 SCHEDULE OF VALUES

A. Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:

a. Contractor's construction schedule.
b. Application for Payment forms.
c. List of subcontractors.
d. Schedule of alternates.
e. List of products.
f. List of principal suppliers and fabricators.

g. Schedule of submittals.

2. Submit the Schedule of Values to the Owner at the earliest feasible date, but in no case later than seven (7) days before the date scheduled for submittal of the initial Application for Payment.

B. If applicable, the format and content of the Schedule of Values shall match the project's unit pricing. The Contractor is strongly encouraged to utilize spreadsheet software for preparation of all pay applications.

1. Include the following Project identification on the Schedule of Values:

a. Project name and location.
b. Purchase order number.
c. Contractor's name and address.
d. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a. Itemized description.
b. Related Specification Section
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that have affected value.
g. Dollar value.
h. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.

3. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
4. Show line items for indirect costs and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.
5. Update and resubmit the Schedule of Values when Change Orders result in a change in the Contract Sum.

1.5 PROCEDURES

A. Informal submittal

1. Make informal submittal of request for payment by filling in, with erasable pencil, pertinent portions of AIA Document G702, "Application and Certification for Payment," plus continuation sheet or sheets of AIA Document G703.
2. Make this preliminary submittal to the Architect and Owner in accordance with the Owner's payment schedule.
3. Revise the informal submittal of the request for payment as directed by the Owner, initialing all copies.

B. Formal submittal

1. Make formal submittal of request for payment by filling in the agreed data, by typewriter or neat lettering in ink, on AIA Document G702, “Application and Certification for Payment,” plus continuation sheet(s) of AIA Document G703.
2. Sign and notarize the Application and Certificate for Payment.
3. Reference Purchase Order number on Application for Payment
4. Secure and file with submittal progress waivers for all materials incorporated into and labor and equipment employed on the work before payment requests are processed.

    a. Initial payment will be processed without progress waivers. Subsequent requests will require progress waivers for previous payment.

5. Submit the original of the Application and Certificate for Payment and the continuation sheet or sheets to the Architect and Owner for approval.
6. The Architect and Owner will compare the formal submittal with the approved informal submittal and, when approved, will sign the Application and Certificate for Payment, will make and distribute required copies. The Owner will disburse directly to the Contractor the amount certified less 10% retainage.
7. Approved formal submittals must be received by the Owner in accordance with the Owner’s payment schedule.
8. Certified payroll records must be submitted along with the formal submittal as described in the General Conditions.

PART 2 – PRODUCTS

(NOT APPLICABLE)

PART 3 – EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 02 70

SECTION 01 04 50

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section establishes general requirements pertaining to cutting (including excavation), fitting and patching of the Work required.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

B. Execute cutting (including excavation), filling or patching of work, required to:

1. Make several parts fit properly.
2. Uncover work to provide for installation of ill-timed work.
3. Remove and replace defective work.
4. Remove and replace work not conforming to the Contract requirements.
5. Remove samples of installed work as specified for testing.
6. Install specified work in existing construction.

C. In addition to Contract requirements, upon written instruction of the Owner:

1. Uncover work to provide for observation of covered work.
2. Remove samples of installed materials for testing.
3. Remove work to provide for alteration of existing work.

D. Do not cut or alter work of another contractor without written consent of the Owner.

1.3 SUBMITTALS

A. Prior to cutting which affects structural safety of Project, or work of another contractor, submit written notice to the Owner requesting consent to proceed with cutting.

B. Include the following:

1. Project identification.
2. Description of affected work.
3. Necessity for cutting.
4. Effect on other work and on structural integrity of Project.
5. Description of proposed work. Designate:

    a. Scope of cutting and patching.
    b. Contractor and trades to execute the work.
    c. Products proposed to be used.
    d. Extent of refinishing.

6. Alternatives to cutting and patching.
7. Designation of party responsible for cost of cutting and patching.

C. Prior to cutting and patching done by instruction of Owner, submit cost estimate.

D. Should conditions of work or schedule indicate change of materials or methods, submit recommendations to the Owner, including:

1. Conditions indicating change.
2. Recommendation for alternative materials or methods.
3. Submittals as required for substitutions.

E. Submit written notice to the Owner, designating time the work will be uncovered to provide for observation.

1.4 PAYMENT FOR COSTS

A. Costs caused by ill-timed or defective work, or work not conforming to Contract Documents: Party responsible for ill-timed, rejected or non-conforming work.

B. Work done on instruction of the Owner (by Change Order), other than defective or non-conforming work shall be paid for by the Owner.

1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. For replacement of work removed, comply with Specifications for type of work to be performed.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect existing conditions of work, including elements subject to movement or damage during:
1. Cutting and patching.
2. Excavating and backfilling

B. After uncovering work, inspect conditions affecting installation of new products.

3.2 PREPARATION

A. Prior to cutting:
1. Provide shoring, bracing and support as required to maintain structural integrity of project.
2. Provide protection for other portions of the project.
3. Provide protection from the elements.

3.3 PERFORMANCE

A. Execute fitting and adjustment or provide finished installation to comply with specified tolerances and finishes.

B. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs and new work.

C. Execute excavating and backfilling by methods which will prevent damage to other work, and will prevent settlement.

D. Restore work which has been cut or removed; install new products to provide complete work in accordance with contract requirements.

E. Refinish entire surfaces as necessary to provide an even finish.
   1. Continuous surfaces: to nearest intersection (s).
   2. Assembly: entire refinishing.

END OF SECTION

SECTION 01 05 10

GRADES, LINES AND LEVELS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide such field engineering services as are required for proper completion of the Work including, but not necessarily limited to:

1. Establishing and maintaining grades, lines and levels;
2. Structural design of shores, forms and similar items provided by the Contractor as part of the means and methods of establishing and maintaining grades lines and levels.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.3 OWNER WILL FURNISH

A. A topographic map of the site as part of the Construction Documents, providing the following locations, dimensions and data:

1. Grades, contours and lines of pavements and ground conditions.
2. Above ground utility locations.
3. Trees and vegetation.

1.4 SUBMITTALS

A. Submit a record of Work performed and record survey data as required under provisions of Section 01 30 00 – SUBMITTALS and Section 01 72 00 – PROJECT RECORD DOCUMENTS.

B. Comply with pertinent provisions of Section 01 30 00 – SUBMITTALS.

C. Upon written request of the Owner, submit:

1. Data demonstrating qualifications of persons proposed to be engaged for field engineering services.
2. Documentation verifying accuracy of field engineering work.
3. Certification, signed by the contractor's retained field engineer, certifying that elevations and locations of improvements are in conformance or nonconformance with requirements of the Contract Documents.

1.5 CONSTRUCTION SURVEYS

A. The Contractor shall employ a land surveyor, registered in the state of Illinois and acceptable to the Owner for verification of existing conditions and for layout of its own work including all lines, elevations and measurements of all site improvements, utilities and other work executed by it under the Contract.

B. The Contractor shall immediately upon entering the site for purpose of beginning work locate general reference points and take such action as is necessary to prevent their destruction. The Contractor must exercise proper precaution to verify figures on the drawings before laying out work and will be held responsible for any error resulting from its failure to exercise such precaution.

C. The Contractor shall make provision to preserve property line stakes, benchmarks or datum points. If any are lost, displaced or disturbed through neglect of the Contractor, its agents, or employees, the Contractor shall pay the cost of restoration.

PART 2 – PRODUCTS

(NOT APPLICABLE)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify layout information shown on the Drawings, in relation to the plans before proceeding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

B. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.

1. Promptly replace lost or destroyed project control points. Base replacements on original survey control points.
2. Establish and maintain a minimum of two permanent benchmarks on the site or reference to data established by survey control points.
3. Record benchmark locations with horizontal and vertical data on Project Record Documents.

C. The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site-work, investigate and verify the existence and location of underground utilities and other construction.

D. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas and water service piping.

3.2 PERFORMANCE

A. Working from lines and levels established by the plans, establish benchmarks and markers to set lines and levels as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

B. Advise entities engaged in construction activities, of marked lines and levels provided for their use.

C. As construction proceeds, check every major element for line, level and plumb.

D. Maintain a surveyor's log of control and other survey work. Make this log available at the job site for reference.

E. Record deviations from required lines and levels and advise the Owner when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

F. On completion of any work requiring field engineering services, prepare a certified survey showing dimensions, locations, angles and elevations of construction and site-work. Deliver this certified survey to the Owner in hardcopy and electronic format (AutoCAD).

G. Locate and layout site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

H. Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

END OF SECTION 01 05 10

SECTION 01 06 00

REGULATORY REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Contractors shall comply with all laws, rules and regulations governing the Work.

1. When Contractor observes that Contract Documents are in variance with specified codes, notify the Owner in writing immediately. The Owner will issue all changes in accord with the General Conditions.

2. When Contractor performs any Work knowing or having reason to know that the Work is contrary to such laws, rules and regulations and fails to so notify the Owner, the Contractor shall pay all costs arising therefrom. However, it will not be the Contractor's primary responsibility to make certain that the Contract Documents are in accord with such laws, rules and regulations.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.3 DEFINITIONS AND ABBREVIATIONS

A. Definitions

1. "Codes" means rules, regulations or statutory requirements of government agencies.
2. "Standards" means requirements set by authorities, custom or general consent and establish accepted criteria.

B. Abbreviations

1.	ADA	Americans with Disabilities Act
2.	AGCI	Associated General Contractors in Illinois
3.	ANSI	American National Standards Institute
4.	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
5.	ASTM	American Society of Testing and Materials
7.	COE	City of Evanston
8.	CPSC	Consumer Product Safety Commission (Federal)
9.	FM	Factory Mutual Engineering Corp.

9.	IBC	Internation Building Code
10.	IDOL	Illinois Department of Labor
11.	IDOT	Illinois Department of Transportation
12.	IDPH	Illinois Department of Public Health
13.	IEPA	Illinois Environmental Protection Agency
14.	IECC	Internation Energy Conservation Code
14.	ISPE	Illinois Society of Professional Engineers
15.	NFPA	National Fire Protection Association
16.	SFM	Office of State Fire Marshall
17.	UL	Underwriters Laboratories, Inc.

1.4 QUALITY ASSURANCE

A. Contractor shall:

1. Ensure that copies of specified codes and standards are readily available to Contractor's personnel. Copies are available at Contractor's expense from source or publisher.
2. Ensure that Contractor's personnel are familiar with workmanship and installation requirements of specified codes and standards.

1.5 REFERENCE SPECIFICATIONS

A. The Specifications referred to herein shall be interpreted to mean the following and shall include all addenda, changes to, etc. Reference to Engineer shall mean Owner.

1. "Standard Specifications" – The Illinois Department of Transportation's (IDOT's) "Standard Specifications for Road and Bridge Construction", latest edition.
2. "Supplemental Specifications" – IDOT's "Supplemental Specifications and Recurring Special Provisions", latest edition.
3. "Traffic Specifications" – IDOT's "Standard Specifications for Traffic Control Items", latest edition.
4. "Standard Sewer Specifications" – The "Standard Specifications for Water and Sewer Main Construction in Illinois", latest edition.

1.6 REGULATORY REQUIREMENTS

A. Source and requirements:

1. EBA: "Environmental Barriers Act" Illinois Accessibility Code

2. ADA: Americans with Disabilities Act
3. ISPC: Illinois State Plumbing Code, current edition
4. IEPA: (current editions at date of bidding documents)

a. Air Pollution Standards
b. Noise Pollution Standards
c. Water Pollution Standards
d. Public Water Supplies
e. Solid Waste Standards
f. Illinois Recommended Standards for Sewage Work

5. Illinois Purchasing Act, as amended (Illinois Compiled Statutes, 30 ILCS 505/1 et seq)

6. OSFM:

a. Gasoline and Volatile Oils (Illinois Compiled Statutes, 430 ILCS 15/0.01 et seq)
b. Liquefied Petroleum Gases (Illinois Compiled Statutes, 430 ILCS 5/0.01 et seq)
c. Liquefied Petroleum Gas Containers (Illinois Compiled Statutes, 430 ILCS 10/0.01 et seq)
d. Boiler and Pressure Vessel Safety Act and Rules and Regulations (Illinois Compiled Statutes, 430 ILCS 75/1 et seq)
e. Illinois Rules and Regulations for Fire Prevention and Safety, as amended 24 December 1973.

7. CODES:

a. City of Evanston “City Ordinances” and “Building Code”, current editions.
b. Work not covered by above codes: Use NFPA National Fire Codes, current edition.

B. The Owner may reference other codes or standards throughout the Project Manual when deemed appropriate for proper compliance with regulatory requirements.

PART 2 – PRODUCTS

(NOT APPLICABLE)

PART 3 – EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 06 00

SECTION 01 09 50

REFERENCE STANDARDS AND DEFINITIONS

PART 1 – GENERAL

1.1 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.2 DEFINITIONS

A. General: basic contract definitions are included in the General Conditions.

B. Indicated: the term “indicated” refers to graphic representations, notes or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as “shown,” “noted,” “scheduled” and “specified” are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed: terms such as “directed,” requested,” “authorized,” “selected,” “approved,” “required” and “permitted” mean “directed by the Owner,” “requested by the Owner” and similar phrases.

D. Approve: the term “approved,” where used in conjunction with the Owner action on the Contractor’s submittals, applications and requests, is limited to the Owner’s duties and responsibilities as stated in the General Conditions.

E. Regulation: the term “regulations” includes laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of the Work.

F. Furnish: the term “furnish” is used to mean “supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation and similar operations.”

G. Install: the term “install” is used to describe operations at project site including the actual “unloading, unpacking, assembly, installation, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.”

H. Provide: the term “provide” means “to furnish and install, complete and ready for the intended use.

I. Installer: an “installer” is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor or sub-subcontractor, for performance of a particular construction activity, including installation, erection, application and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: except where 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. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: where the date of issue of a referenced standard is not specified, comply with the standard in effect as of date of Contract Documents.

C. Conflicting Requirements: where compliance with two or more standards is specified, and the standards establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, but apparently equal, and uncertainties to the Owner for a decision before proceeding.

1. Minimum Quality or Quantity 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. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Owner for a decision before proceeding.

D. Copies of Standards: each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.
2. Although copies of standards needed for enforcement of requirements may be included as part of required submittals, the Owner reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.

E. Abbreviations and Names: trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries. The following acronyms or abbreviations as referenced in Contract Documents are defined to mean the associated names. Names and addresses are subject to change and are believed to be but are not assured to be accurate and up to date as of date of Contract Documents.

AA	Aluminum Assoc. 900 19th St, NW, Suite 300 Washington, DC 20006 (202) 862-5100	AAMA	American Architectural Manufacturer's Assoc. 1540 E. Dundee Rd, Suite 310 Palatine, IL 60067 (708) 202-1350	AAN	American Assoc. of Nurserymen 1250 Eye St, NW, Suite 500 Washington, DC 20005 (202) 789-2900
AASHTO	American Assoc. of State Highway and Transportation Officials	ACI	American Concrete Institute PO Box 19150 Detroit, MI 48219-	ACIL	American Council of Independent Laboratories 1725 K St, NW

	444 N. Capitol St, Suite 225 Washington, DC 20001 (202) 624-5800		0150 (313) 532-2600		Washington, DC 20006 (202) 887-5872
ACPA	American Concrete Pipe Assoc. 8320 Old Courthouse Rd. Vienna, VA 22180 (703) 821-1990	AGA	American Gas Assoc. 1515 Wilson Blvd. Arlington, VA 22209 (703) 841-8400	AHA	American Hardboard Assoc. 520 N. Hicks Rd. Palatine, IL 60067-3609 (708) 934-8800
AI	Asphalt Institute Research Park Drive PO Box 14052 Lexington, KY 40512-4052 (606) 288-4960	AIA	American Institute of Architects 1735 New York Ave, NW Washington, DC 20006 (202) 626-7300	A.I.A.	American Insurance Assoc. 1130Connecticut Ave, NW Washington, DC 20036 (202) 828-7100
AISC	American Institute of Steel Construction 1 E. Wacker Dr, Suite 3100 Chicago, Il 60601-2001 (312) 670-2400	AISI	American Iron and Steel Institute 1101 17th St. NW, Suite 1300 Washington, DC 20005-2701 (202) 452-7100	AITC	American Institute of Timber Construction 11818 SE Mill Plain Blvd, Ste.415 Vancouver, WA 98684-5092 (206) 254-9132
ALI	Associated Laboratories 641 S. Vermont St. Palatine, IL 60067 (708) 358-7400	ALSC	American Lumber Standards Committee PO Box 210 Germantown, MD 20874 (301) 972-1700	ANSI	American National Standards Institute 11 W. 42nd Street New York, NY 10036 (212) 354-3300
AOSA	Assoc. of Official Seed Analysts C/o Jim Lair Illinois Dept. of Agriculture Seed Lab Box 19281 Springfield, IL 62794 (217) 782-7655	APA	American Plywood Assoc. PO Box 11700 Tacoma, WA 98411 (206) 565-6600	API	American Petroleum Institute 1220 L St, NW Washington, DC 20005 (202) 682-8000
ASC	Adhesive and Sealant Council 1627 K Street, NW, Suite 1000 Washington, DC 20006 (202) 452-1500	ASHRAE	American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc. 1791 Tullie Circle, NE Atlanta GA 30329-2305	ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd, Suite 210 Westlake, CA 91362 (805) 495-7120	ASSE	American Society of Sanitary Engineers PO Box 40362 Bay Village, OH 44140	ASTM	American Society for Testing and Materials 1916 Race St Philadelphia, PA 19103 (215) 299-5400

			(216) 835-3040		
AWI	Architectural Woodwork Institute 2310 S. Walter Reed Dr. Arlington, VA 22206 (703) 671-9100	AWPA	American Wood Preservers Assoc. PO Box 286 Woodstock, MD 21163 (410) 465-3169	AWPB	American Wood Preservers Bureau PO Box 5283 Springfield, VA 22150 (703) 339-6660
AWS	American Welding Society PO Box 351040 550 LeJeune Road, NW Miami, FL 33135 (305) 443-9353	AWWA	American Water Works Assoc. 6666 W Quincy Ave Denver, CO 80235 (303) 794-7711	BANC	Brick Assoc. of North Carolina PO Box 13290 Greensboro, NC 27415 (919) 273-5566
BHMA	Builders Hardware Manufacturers Assoc. 355 Lexington Ave, 17th Floor New York, NY 10017 (212) 661-4261	BIA	Brick Institute of America 11490 Commerce Park Dr. Suite 300 Reston, VA 22091 (703) 620-0010	CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Rd, Ste 419 Chattanooga, TN 37421 (615) 892-0137
CRSI	Concrete Reinforcing Steel Institute 933 Plumb Grove Rd. Schaumburg, IL 60195 (708) 517-1200	EJMA	Expansion Joint Manufacturers Assoc. 25 N. Broadway Tarrytown, NY 10591 (914) 332-0040	ETL	ETL Testing Laboratories Inc. PO Box 2040 Route 11, Industrial Park Cortland, NY 13045 (607) 753-6711
HMA	Hardwood Manufacturers Assoc. 2831 Airways Blvd., Ste 205, Bldg. B Memphis, TN 38132 (901) 346-2222	HPMA	Hardwood Plywood Manufacturers Assoc. 1825 Michael Farraday Dr PO Box 2789 Reston, VA 22090-2789 (703) 435-2900	ICEA	Insulated Cable Engineers Assoc. Inc. PO Box 440 South Yarmouth, MA 02664 (617) 394-4424
IEEE	Institute of Electrical and Electronic Engineers 345 E. 47th Street New York, NY 10017 (212) 705-7900	IESNA	Illuminating Engineering Society of North America 345 E 47th Street New York, NY 10017 (212) 705-7926	ILI	Indiana Limestone Institute of America Stone City Bank Bldg, Ste 400 Bedford, IN 47421 (812) 275-4426
IMSA	International Municipal Signal Assoc. PO Box 539 1115 N. Main Street Newark, NY 14513 (315) 331-2182	IRI	Industrial Risk Insurers 85 Woodland St Hartford, CT 06102 (203) 520-7300	LPI	Lightning Protection Institute PO Box 1029 Woodstock, IL 60098 (815) 337-0277
MBMA	Metal Building Manufacturers Assoc. 1230 Keith Building	MCAA	Mechanical Contractors Assoc. of America	NAAMM	National Assoc. of Architectural Metal Manufacturers

	Cleveland, OH 44115-2180		5410 Grosvenor Lane, Ste 120 Bethesda, MD 20814 (301) 897-0770		600 S. Federal St, Ste 400 Chicago, IL 60605 (312) 922-6222
NAPA	National Asphalt Pavement Assoc. Calvert Building, Suite 620 6811 Kenilworth Ave. Riverdale, MD 20737 (301) 779-4880	NAPF	National Assoc. of Plastic Fabricators (Now DLPA)	NBGQA	National Building Granite Quarries Assoc. PO Box 482 Barre, VT 05641 (802) 476-3115
NBHA	National Builders hardware Assoc. (Now DHI)	NCMA	National Concrete Masonry Assoc. 2302 Horse Pen Rd PO Box 781 Herndon, VA 22070-3406 (703) 435-4900	NEC	National Electric Code (Now NfiPA)
NECA	National Electrical Contractors Assoc. 7315 Wisconsin Ave Bethesda, MD 20814 (301) 657-3110	NEMA	National Electrical Manufacturers Assoc. 2101 L St, NW, Ste 300 Washington, DC 20037 (202) 457-8400	NFiPA	National Fire Protection Assoc. 1 Batterymarch Park Quincy, MA 02269 (617) 770-3000
NFoPA	National Forest Products Assoc. 1250 Connecticut Ave, NW, Suite 200 Washington DC 20036 (202) 463-2700	NHLA	National Hardwood Lumber Assoc. PO Box 34518 Memphis, TN 38184 (901) 377-1818	NLGA	National Lumber Grades Authority 1055 W Hastings St. Ste 260 Vancouver, British Columbia Canada V6E 2H1 (604) 687-2171
NPA	National Particleboard Assoc. 18928 Premiere Court Gaithersburg, MD 20879-1569 (301) 670-0604	NPCA	National Paint and Coatings Assoc. 1500 Rhode Island Ave, NW Washington, DC 20005 (202) 462-6272	NSF	National Sanitation Foundation PO Box 1468 3475 Plymouth Rd Ann Arbor, MI 48106 (313) 769-8010
NWMA	National Woodwork Manufacturers Assoc. (Now NWWDA)	PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077-4321 (847) 966-6200	PCI	Prestressed Concrete Institute 175 W Jackson Blvd Chicago, IL 60604-9773 (312) 786-0300
PDI	Plumbing and Drainage Institute C/o Saul Baker 1106 W. 77th Street, South Dr. Indianapolis, IN 4626	RIS	Redwood Inspection Service 405 Enfrente Dr, Suite 300 Novato, CA 94949 (415) 382-0662	RMA	Rubber Manufacturers Assoc. 1400 K St, NW Washington, DC 20005 (202) 682-4800

	(317) 251-6970				
SHLMA	Southern Hardwood Lumber Manufacturers Assoc. (Now HMA)	SJI	Steel Joist Institute Suite A 1205 48th Ave North Myrtle Beach, SC 29577	SPIB	Southern Pine Inspection Bureau 4709 Scenic Highway Pensacola, FL 32504 (904) 434-2611

SSPC	Steel Structures Painting Council 4400 Fifth Ave. Pittsburgh, PA 15213 (412) 268-3327	SSPMA	Sump and Sewage Pump Manufacturers Assoc. 560 W Washington St, Ste 301 Chicago IL, 60606 (312) 332-4146	TPI	Truss Plate Institute 583 D'Onofrio Drive Suite 200 Madison, WI 53719
UL	Underwriters Laboratories 333 Pfingsten Rd. Northbrook, IL 60062 (847) 272-8800	WCLIB	West Coast Lumber Inspection Bureau PO Box 23145 Portland, OR 97223 (503) 639-0651	WIC	Woodwork Institute of California PO Box 11428 Fresno, CA 93773 (209) 233-9035
WRI	Wire Reinforcement Institute 1101 Connecticut Ave, NW Washington, DC 20036-4303 (703) 790-9790	WWPA	Western Wood Products Assoc. 522 SW 5th Ave, Yeon Bldg. Portland,OR 97204-2122 (503) 224-3930	W.W.P.A.	Woven Wire Products Assoc. 2515 N. Nordica Ave. Chicago, IL 60635 (312) 637-1359

F. Federal Government Agencies: names and titles of federal government standard or specification producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard or specification producing agencies of the federal government. Names and addresses are subject to change; they are believed to be but are not assured to be accurate and up to date as of the date of the Contract Documents.

CE	Corps of Engineers (US Dept of the Army) Chief of Engineers – Referral Washington, DC 20314 (202) 272-0660	CFR	Code of Federal Regulations Available from the Government Printing Office N. Capitol St between G and H St, NW Washington, DC 20402 (202) 783-3238 (Material is usually first published in the Federal Register)	CPSC	Consumer Product Safety Commission 5401 Westbard Ave, Room 700 Washington, DC 20816 (800) 638-2772
CS	Commercial Standard (US Dept of Commerce) Government Printing Office Washington, DC 20402 (202) 377-2000	DOC	Department of Commerce 14th St and Constitution Ave, NW Washington, DC 20230 (202) 377-2000	DOT	Department of Transportation 400 7th St, SW Washington, DC 20590 (202) 366-4000
EPA	Environmental Protection Agency	FAA	Federal Aviation Administration	FCC	Federal Communications

	401 M St, SW Washington, DC 20460 (202) 382-2090		(US Dept of Transportation) 800 Independence Ave, SW Washington, DC 20590 (202) 366-4000		Commission 1919 M St, NW Washington, DC 20554 (202) 632-7000
FHA	Federal Housing Administration (US Dept of Housing and Urban Development) Director Manufactured Housing and Construction Standards Division 451 7th St, SW, Room 9158 Washington, DC 20201 (202) 755-5210	FS	Federal Specification (from GSA) Supt. Of Documents, Government Printing Office 7th and D St, SW Washington, DC 20234 (202) 472-2205 or 472-2140	GSA	General Services Administration F St and 18th St, NW Washington, DC 20405 (202) 472-1082
MIL	Military Standardization Documents (US Dept of Defense) Naval Publications and Forms Center 5801 Tabor Ave Philadelphia, PA 19120	NIST	National Institute of Standards and Technology (US Dept of Commerce) Gaithersburg, MD 20899 (301) 975-2000	OSHA	Occupational Safety and Health Administration (US Dept of Labor) Government Printing Office Washington, DC 20402 (202) 523-6091
PS	Product Standard of NBS National Institute of Standards and (DOC) Technology Standards Management Program A 625 Administration Gaithersburg, MD 20899 (202) 783-3238	USDA	US Dept of Agriculture Independence Ave btwn. 12th and 14th St, SW Washington, DC 20250 (202) 447-8732	USPS	US Postal Service 475 L'Enfant Plaza, SW Washington, DC 20260 (202) 268-2000

1.4 GOVERNING REGULATIONS/AUTHORITIES

A. The Owner has contacted authorities having jurisdiction where necessary to obtain information necessary for preparation of Contract Documents; that information may or may not be of significance to the Contractor. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.

B. Copies of Regulations: Obtain copies of the applicable regulations and retain at the Project site, available for reference by parties who have a reasonable need for such reference.

1.5 SUBMITTALS

A. Permits, Licenses and Certificates: for the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional, settlements, notices, receipts for fee payments, judgements and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 – PRODUCTS

(NOT APPLICABLE)

PART 3 – EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 09 50

SECTION 01 10 50

EXISTING UTILITY PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. Perform the work associated with existing utilities, including removal, relocation, interruption and protection, meeting requirements of this section.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this section.

1.3 GENERAL

A. Notification: before beginning any work, the Contractor shall notify all utility companies, public and private as applicable and any other party owning, operating or maintaining utility facilities on or in vicinity of project site in accordance with notification procedures of each utility company or any other party.

B. Protection:

1. Before beginning any work, the Contractor shall investigate and inform himself of locations and extent of all utilities on and in vicinity of project site which may be encountered in performing the work and shall take suitable care to protect and prevent damage and cessation of operation to such utilities from his operations.
2. When performing adjacent to existing sewers, drains, water and gas lines; electric, telephone or telegraph conduit or cable; pole lines or poles, or other utility facilities, equipment or structures, which are to remain in operation, contractor shall maintain such utility facilities, equipment and structures in place and protect from damage and cessation of operation and shall cooperate with applicable utility company and any other party owning, operating or maintaining such utility facilities, equipment or structures.
3. Methods of protection shall be subject to approval of utility company and any other party owning, operating or maintaining such utility, equipment or structure.

C. Damages:

1. Should existing utilities which are to remain in operation be damaged during construction operations, the Contractor shall immediately notify utility company, Owner and any other party owning, operating or maintaining such utility.
2. The Contractor shall be responsible for and shall repair or replace at the Contractor’s expense, as applicable, damages to any such utility facilities, equipment or structures caused by his acts, whether negligent or otherwise, or his omission to act, whether negligent or otherwise, and shall leave such utility facilities, equipment or structures in as good condition as existed prior to commencement of his operations as approved by utility company and any other party owning, operating or maintaining such utility. In addition, the Contractor shall be responsible for any damages or liability which the Owner may be held liable. Materials and methods of repair or replacement shall be subject to

approval of utility company and other party owning, operating or maintaining such utility.

3. However, any such utility equipment or structures damaged as a result of any act, or omission to act, of the Contractor, may, at option of applicable utility company and any other party owning, operating or maintaining such utility facilities, equipment or structures damaged, be repaired or replaced by such applicable utility company or other party. In such event cost of repairs or replacement shall be the responsibility of the Contractor at no addition to the Contract Sum.

1.4 PROCEDURES

A. Locations:

1. Request all utility companies and any other party owning, operating or maintaining utility facilities on or in vicinity of project site as applicable, to locate or stakeout locations, extent, alignment and elevation of such utility facilities.
2. Approximate locations and extent of known existing utility facilities, equipment and structures may be determined by examining documents of utility companies and any other party owning, operating or maintaining such utility facilities, and available information documents and Drawings for the work.
3. Should uncharted or incorrectly charted existing utility facilities, equipment and structures be encountered during performance of the Work, consult utility companies and other party owning, operating or maintaining such utility facilities for directions.
4. After such utilities have been uncovered and their actual locations and extent determined, the Owner will furnish additional Drawings, if relocation is required, subject to approval of utility companies and any other parties owning, operating or maintaining such utility facilities.
5. Submit record drawings showing locations and extent discrepancies of utilities those indicated in available reference documents or Drawings for the Work, regardless of cause of location or extent discrepancy, meeting, requirements of the general conditions.

B. Scheduling:

1. General: existing utilities shall not be disturbed until utility companies and any other party owning, operating or maintaining such utility facilities and users of such utilities have been notified in accordance with notification procedure of such utility companies or any other parties. Contractor shall conduct work so that utility may be removed, relocated or supported during construction operations and maintained in service until the work to be provided under Contract is completed.
2. Any existing utility should be relocated only as approved by utility companies and any other parties owning, operating or maintaining such utility facilities. Contractor shall cooperate with utility companies and any other parties in performance of this work.
3. Interruptions: when Contractor desires to take an existing utility service out of operation, notify Owner at least 72 hours in advance of such time and obtain written permission of utility company or other parties owning, operating or maintaining such utility facilities prior to interrupting service. Interruption of service shall be kept to an absolute minimum.

    a. Utility company and any or other parties owning, operating or maintaining such utility facilities shall have right to require Contractor to perform work which requires such interruptions in stages and during non-standard

working hours to reduce time of each interruption, at no addition to Contract Sum.

b. When necessary, provide acceptable temporary utility services during such interruptions, before taking utility service out of operation, at no addition to Contract Sum.

PART 2 – PRODUCTS

(NOT APPLICABLE)

PART 3 – EXECUTION

(NOT APPLICABLE)

END OF SECTION 011050

SECTION 01 20 00

PROJECT MEETINGS

PART 1 – GENERAL

1.1 SUMMARY

A. This section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Pre-construction Conference
2. Pre-installation Conferences
3. Coordination Meetings
4. Progress Meetings

B. Construction schedules are specified in Section 01 30 00 – SUBMITTALS.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.3 PRE-CONSTRUCTION CONFERENCE

A. The Owner shall schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: The Owner, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conduct matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress including such topics as:

1. Tentative construction schedule
2. Critical Work sequencing
3. Designation of responsible personnel
4. Procedures for processing field decisions and Change Orders
5. Procedures for processing Applications for Payment
6. Distribution of Contract Documents
7. Submittal of Shop Drawings, Product Data and Samples
8. Preparation of record documents
9. Use of the premises
10. Office, Work and storage areas
11. Equipment deliveries and priorities
12. Safety procedures
13. First aid
14. Security
15. Housekeeping
16. Construction activity policies and working hours

17. MBE/WBE/EBE and LEP requirements
18. Coordination with affected utilities and governing jurisdictions

1.4 PRE-INSTALLATION CONFERENCE

A. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Owner of scheduled meeting dates.

B. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:

1. Contract Documents
2. Options
3. Related Change Orders
4. Purchases
5. Deliveries
6. Shop Drawings, Product Data and quality control samples
7. Possible conflicts
8. Compatibility problems
9. Time schedules
10. Weather limitations
11. Manufacturer’s recommendations
12. Compatibility of materials
13. Acceptability of substrates
14. Temporary facilities
15. Space and access limitations
16. Governing regulations
17. Safety
18. Inspection and testing requirements
19. Required performance results
20. Recording requirements
21. Protection

C. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner.

D. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 PROGRESS MEETINGS

A. Conduct progress meetings at the Project site at regularly scheduled intervals. Notify the Owner of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment requests.

B. Attendees: in addition to the Owner, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

D. Contractor's Construction Schedule: review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time, ahead or behind 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 Period.

E. Review the present and future needs of each entity present, including such items as:

1. Interface requirements
2. Time
3. Sequences
4. Deliveries
5. Off-site fabrication problems
6. Access
7. Site utilization
8. Temporary facilities and services
9. Hours of Work
10. Hazards and risks
11. Housekeeping
12. Quality and Work standards
13. Change Orders
14. Documentation of information for payment requests.

F. Reporting: no later than three (3) days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

G. Schedule Updating: revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 – PRODUCTS

(NOT APPLICABLE)

PART 3 – EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 20 00

SECTION 01 21 00

ALLOWANCES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Other provisions concerning Allowances also may be stated in other Sections of these Specifications.

1.2 SUMMARY

A. The allowance is general and is to be used to provide adequate budget and bonding to cover items not able to be precisely determined by the Owner prior to bidding including any unforeseen conditions that are discovered. Allow within the proposed Total Base Bid Amount the amounts described in this Section.

B. Allowance work shall be pre-approved prior to the start of and during the Construction with Proposals documenting the work to be performed, with clearly stated not-to-exceed costs and step by step method of procedures for the proposed work stated. Proposals must be submitted and accepted by the Owner prior to starting any allowance work. After discovering an unforeseen condition, the contractor shall submit a Proposal that includes a report summarizing the found condition. The Consultant and Owner will view the unforeseen condition to determine if the work will be authorized. Allowance work shall only be authorized by written Allowance Authorization. Under no circumstances shall the Contractor move forward with the work in question nor shall the contractor expend allowance without an approved Allowance Authorization.

1.3 ALLOWANCE RESPONSIBILITIES

A. Consultant Responsibilities:

1. Consult with Contractor in consideration and selection of products, suppliers and installers.
2. Select products or services in consultation with Owner.
3. Review method of procedure and costs documented on Proposals submitted by the Contractor and transmit Owner’s decision to Contractor. Owner approved Allowance Authorizations are required prior to proceeding with Allowance Work.
4. Review, recommend and transmit Allowance Authorization to Owner for approval.
5. Transmit Owner’s decision to the Contractor.

B. Contractor’s Responsibilities:

1. Assist Consultant in selection of products, suppliers and installers.
2. Obtain proposals from suppliers and installers and offer recommendations and review of proposals submitted. Transmit to Consultant on Proposal forms, attaching all supporting documentation. Include any bond cost adjustments with the proposal. Include scheduling information and assessment of impact of other work.

3. On notification of selection by Consultant, execute purchase agreement with designated supplier and installer.
4. Arrange for and process shop drawings, product data and samples. Arrange for delivery.
5. Promptly inspect products upon delivery for completeness, damage and defects. Submit claims for transportation damage.
6. Document thoroughly all costs related to the work.
7. Provide the Consultant with fully documented Proposals detailing all allowance work to be performed.

1.4 ALLOWANCE DOCUMENTATION

A. All work covered by Allowances must be thoroughly documented as follows:

1. Upon encountering any field conditions which is not as shown in Construction Documents, the Contractor shall immediately notify the Consultant and develop a written Proposal detailing any additional work required. Proposals shall include a report summarizing the found condition to the Consultant. Contractor work initiated without submitting a completed Proposal and obtaining the Owner's written approval by Allowance Authorization is performed entirely at Contractor's own risk and cost, regardless of any prior verbal approval.
2. The Consultant shall review the Proposal and provide the Owner with a written recommendation regarding the proposed work.
3. The Owner shall review the Contractor's Proposal and the Consultant's recommendation and, if appropriate, provide written approval via Allowance Authorization for use of the Allowance.

1.5 SCHEDULE OF ALLOWANCES

Allowance Number 1, Contaminated Soil Work: $200,000.00

Allowance Number 2, Additional Work – General: $80,000.00

1.6 ALLOWANCE EXCLUSIONS

A. General

1. Additional costs related to improper scheduling, sequencing or coordination will not be covered within the Allowance, as determined solely by the Owner.

B. Existing Building Component Exclusions

1. All work required to protect existing building surfaces and components is included in the Base Bid and will not be covered within the Allowance.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

(Not Used)

END OF SECTION 01 21 00

SECTION 01 30 00

SUBMITTALS

PART 1 – GENERAL

1.01 SUMMARY

A. This section specifies administrative and procedural requirements for submittals required for performance of the Work, including:

1. Contractor's construction schedule
2. Submittal schedule
3. Daily construction reports
4. Shop Drawings
5. Product Data
6. Samples

B. Administrative Submittals: refer to other Division 0 and 1 sections and other Contract Documents for requirements for administrative submittals. Such submittals include but are not limited to:

1. Permits
2. Applications for payment
3. Performance and payment bonds
4. Insurance certificates
5. List of subcontractors

C. The Schedule of Values submittal is included in Section 01 02 70 – APPLICATION FOR PAYMENT.

1.02 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 SUBMITTAL PROCEDURES

A. Coordination: coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

a. The Owner reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

3. Processing: allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.

    a. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Owner will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
    b. If an intermediate submittal is necessary, process the same as the initial submittal.
    c. Allow two weeks for re-processing each submittal.
    d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Owner sufficiently in advance of the Work to permit processing.

B. Submittal Preparation: place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4” x 5” on the label or beside the title block on Shop Drawings to record the Contractor’s review and approval markings and the action taken.
2. Include the following information on the label for processing and recording action taken.

    a. Project name
    b. Date
    c. Name and address of Owner
    d. Name and address of Contractor
    e. Name and address of subcontractor
    f. Name and address of supplier
    g. Name of manufacturer
    h. Number and title of appropriate Specification Section
    i. Drawing number and detail reference, as appropriate

C. Submittal Transmittal: package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Owner using a transmittal form. Submittals received from sources other that the Contractor will be returned without action.

1. On the transmittal record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor’s certification that information complies with Contract Document requirements.
2. Transmittal Form: use AIA Document G 810.

1.04 CONTRACTOR’S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: prepare a fully developed, horizontal bar-chart type Contractor’s construction schedule. Submit within 30 days of the date established for “Commencement of the Work”.

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the “Schedule of Values”.

2. Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
3. Prepare a schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress report, payment requests and other schedules.
6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for Owner's procedures necessary for certification of Substantial Completion.

B. Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by requirements for phased completion to permit Work by separate Contractors and partial occupancy by the Owner prior to Substantial Completion.

C. Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.

D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.

E. Cost Correlation: At the head of the schedule, provide a two item cost correlation line, indicating "pre-calculated" and "actual" costs. On the line show dollar-volume of Work performed as of the dates used for preparation of payment requests.

1. Refer to Section 01 02 70 - APPLICATION FOR PAYMENT for cost reporting and payment procedures.

F. Distribution: Following response to the initial submittal, print and distribute copies to the Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

1. When revisions are made, distribute 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 construction activities.

G. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.05 SUBMITTAL SCHEDULE

A. After development and acceptance of the Contractor's construction schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for establishment of the Contractor's construction schedule.

1. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.
2. Prepare the schedule in chronological order; include submittals required during the first 90 days of construction. Provide the following information:

    1. Scheduled date for the first submittal.
    2. Related Section number.
    3. Submittal category.
    4. Name of subcontractor.
    5. Description of the part of the Work covered.
    6. Scheduled date for resubmittal.
    7. Scheduled date of the Owner’s final release or approval.

B. Distribution: Following response to initial submittal, print and distribute copies to the Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office

    1. When revisions are made, distribute 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 construction activities.

C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.06 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Owner at weekly intervals:

    1. List of subcontractors at the site.
    2. Approximate count of personnel at the site.
    3. High and low temperatures, general weather conditions.
    4. Accidents and unusual events.
    5. Meetings and significant decisions.
    6. Stoppages, delays, shortages, losses.
    7. Meter readings and similar recordings.
    8. Emergency procedures.
    9. Orders and requests of governing authorities.
    10. Change Orders received, implemented.
    11. Services connected, disconnected.
    12. Equipment or system tests and start-ups.
    13. Partial Completions, occupancies.
    14. Substantial Completions authorized.

1.07 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Sheet Size: Except for templates, patterns and similar full- size Drawings, submit Shop Drawings on sheets at least 8-1/2" x 11" but no larger than 36" x 48".
7. Submit one correctable translucent reproducible print and three blue- or black-line print for the Owner's review; the reproducible print will be returned.

C. One of the prints returned shall be marked-up and maintained as a "Record Document".

D. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

E. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.

1. Submit coordination Drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

1.08 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

a. Manufacturer's printed recommendations.
b. Compliance with recognized trade association standards.
c. Compliance with recognized testing agency standards.
d. Application of testing agency labels and seals.
e. Notation of dimensions verified by field measurement.
f. Notation of coordination requirements.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

3. Preliminary Submittal: Submit a preliminary single-copy of Product Data where selection of options is required.

4. Submittals: Submit 2 copies of each required submittal; submit 4 copies where required for maintenance manuals. The Owner will retain one, and will return the other marked with action taken and corrections or modifications required.

a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

5. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.

    a. Do not proceed with installation until an applicable copy of Product Data applicable is in the installer's possession.
    b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.09 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.

1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Owner's Sample. Include the following:

    a. Generic description of the Sample.
    b. Sample source.
    c. Product name or name of manufacturer.
    d. Compliance with recognized standards.
    e. Availability and delivery time.

2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

    a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
    b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
    c. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.

3. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.

    a. Preliminary submittals will be reviewed and returned with the Owner's mark indicating selection and other action.

4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.

5. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of construction.

a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
b. Sample sets may be used to obtain final acceptance of the construction associated with each set.

B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.

C. Mock ups specified in individual Sections are special types of Samples. Mock ups are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the Work will be judged.

D. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.10 CONTRACTOR'S RESPONSIBILITIES

A. Review shop drawings, product data and samples prior to submission.

B. Verify:

1. Field dimensions
2. Field construction criteria
3. Catalog numbers and similar data

C. Coordinate each submittal with requirements of Work and of Contract Documents.

D. Contractor's responsibility for errors and omissions in submittals is not relieved by Owner's review of submittals.

E. Contractor's responsibility for deviations in submittals from Contract Document requirements is not relieved by Owner's review of submittals.

F. Notify Owner in writing at time of submission, of deviations in submittals from contract requirements.

G. Do not begin any work which requires submittals without having Owner's stamp and initials or signature indicating review.

H. After Owner’s review, make response required by Owner, stamp and distribute copies.

1.11 SUBMISSION REQUIREMENTS

A. Make all submissions within 35 business days after date of Notice to Proceed.

B. Submit number of copies of shop drawings, project data and samples which Contractor requires for distribution plus 3 copies which will be retained by the Owner.

C. Submit number of samples specified in each of specification sections.

D. Accompany submittals with transmittal letter, in duplicate, containing:

1. Date
2. Project title and number

3. Contractor's name and address
4. The number of each shop drawing, product datum and sample submitted
5. Notification of deviations from contract
6. Other pertinent data

E. Submittals shall include:

1. Date and revision dates
2. Project title and number
3. Names of:

   a. Contractor
   b. Subcontractor
   c. Supplier
   d. Manufacturer
   e. Separate detailer when pertinent

4. Identification of product or material
5. Relation to adjacent structure or material
6. Field dimensions, clearly identified as such
7. Specification Section and page number
8. Applicable standards, such as ASTM number or federal specification
9. Identification of deviation(s) from Contract Documents
10. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements, and compliance with Contract.

1.12 RESUBMISSION REQUIREMENTS

A. Shop drawings:

Revise initial drawings as required and resubmit as specified for initial submittal. Indicate on drawings all changes which have been made other than those requested by Owner.

B. Product Data and Samples:

Submit new datum and samples as required for initial submittal.

C. Make all resubmittals within 10 business days after date on Owner's stamp.

1.13 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Distribute copies of shop drawings and project datum which carry Owner's stamp:

1. Contractor's file
2. Job site file
3. Record documents file
4. Subcontractors
5. Supplier
6. Fabricator

B. Distribute samples as directed.

1.14 OWNER'S ACTION

A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Owner will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Contractor's responsibility.

B. Action Stamp: The Owner will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. Final Unrestricted Release: Where submittals are marked "Furnish as Submitted," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
2. Final-But-Restricted Release: When submittals are marked "Furnish as Corrected," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
3. Returned for Resubmittal: When submittal is marked "Revise and Resubmit", do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
4. Returned, Improper Submittal: When submittal is marked "Rejected" do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication delivery or other activity. The submittal does not conform with project requirements. Prepare a new submittal without delay.
5. Do not permit submittals marked "Rejected, Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.
6. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action Not Required".

PART 2 – PRODUCTS

(NOT APPLICABLE)

PART 3 – EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 30 00

SECTION 01 40 00

QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Owner.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.
2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
3. Requirements for the Contractor to provide quality control services required by the Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.3 RESPONSIBILITIES

A. The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity; these services include those specified to be performed by an independent agency and not by the Contractor. Costs for these services shall be included in the Contract Sum.

1. The Owner will select and the Contractor shall employ and pay an independent agency, to perform specified quality control services.

a. Where the Owner has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the

Contractor shall not employ the entity engaged by the Owner, unless otherwise agreed in writing with the Owner.

2. Re-testing: The Contractor is responsible for re-testing where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

   a. Cost of re-testing construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

3. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

   a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
   b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
   c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
   d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
   e. Security and protection of samples and test equipment at the Project site.

B. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Owner and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
3. The agency shall not perform any duties of the Contractor.

C. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.4 SUBMITTALS

A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Owner, in duplicate, and a copy to the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

2. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:

    a. Date of issue.
    b. Project title and number.
    c. Name, address and telephone number of testing agency.
    d. Dates and locations of samples and tests or inspections.
    e. Names of individuals making the inspection or test.
    f. Designation of the Work and test method.
    g. Identification of product and Specification Section.
    h. Complete inspection or test data.
    i. Test results and an interpretations of test results.
    j. Ambient conditions at the time of sample-taking and testing.
    k. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
    l. Name and signature of laboratory inspector.
    m. Recommendations on re-testing.

1.5 QUALITY ASSURANCE

A. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State of Illinois.

B. Meet basic requirements of ASTM E329 Standard of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel Used in Construction."

C. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during most recent tour of inspection; with memorandum of remedies of all deficiencies reported by inspection.

D. Testing Equipment:

1. Calibrated at maximum 12-month intervals by devices of accuracy traceable to either:

    a. National Bureau of Standards
    b. Accepted values of natural physical constants.

2. Submit copy of certificate of calibration, made by accredited calibration agency.

1.6 LABORATORY DUTIES: LIMITS OF AUTHORITY

A. Cooperate with Owner and Contractor; provide qualified personnel promptly on notice.

B. Perform specified inspections, sampling and testing of materials and construction methods.

1. Comply with specified Standards: ASTM, other recognized authorities, and as specified.

2. Ascertain compliance with Contract requirements.

C. Promptly notify Owner and Contractor of irregularities or deficiencies of work which are observed during performance of services.

D. Promptly submit 5 copies of reports of inspections and tests to Owner including:

1. Date issued
2. Project title and number
3. Testing Laboratory name and address
4. Name and signature of Inspector
5. Date of inspection and sampling
6. Record of temperature and weather
7. Date of test
8. Identification of product and Specification Section
9. Location in project
10. Type of inspection or test
11. Observations regarding compliance with Contract Documents

E. Perform additional services as required by Owner.

F. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on, Contract requirements.
2. Approve or accept any portion of work.
3. Perform any duties of the Contractor.

1.7 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with Laboratory personnel, provide access to work, to manufacturer's operations.

B. Provide Laboratory, preliminary representative samples of materials for testing, in required quantities.

C. Furnish copies of mill test reports.

D. Furnish casual labor and facilities:

1. To provide access to work to be tested.
2. To obtain and handle samples at site.
3. To facilitate inspections and tests.
4. For Laboratory's exclusive use for storage and curing of test samples.

E. Notify Laboratory sufficiently in advance of operations to allow for personnel assignment of test scheduling.

F. Employ, and pay for, services of a separate, equally qualified, Independent Testing Laboratory to perform additional inspections, sampling and testing required.

1. For Contractor's convenience.
2. When initial tests indicate work does not comply with Contract.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for "Cutting and Patching."

B. Protect construction exposed by or for quality control services, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01 40 00

SECTION 01 50 00

TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies administrative and procedural requirements for temporary services and facilities, including utilities, construction and support facilities, and security and protection.

1. Contractor shall be solely responsible for adequacy of temporary facilities, including design and engineering thereof.

B. Construction and support facilities required include but are not limited to:

1. Temporary roadway paving and/or steel plates.
2. Field offices and/or storage sheds.
3. Sanitary facilities, including toilets and drinking water.
4. Dewatering facilities and drains.
5. Temporary enclosures.
6. Waste disposal services.
7. Rodent and pest control.
8. Construction aids and miscellaneous general services and facilities.

C. Security and protection facilities and services required include but are not limited to:

1. Barricades, warning signs and lights.
2. Enclosure fences.
3. Environmental protection.

1.2 RELATED WORK

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.3 QUALITY ASSURANCE

A. Regulations: comply with local codes and ordinances of governing authorities having jurisdiction.

B. Standards: contractor determines and complies with applicable standards for temporary and construction facilities.

C. Inspections: arrange for authorities having jurisdiction to inspect and test each utility before use. Obtain required certification and permits.

1.4 PROJECT CONDITIONS

A. Conditions of use: keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Do not overload temporary services or facilities, or permit them to interfere with construction progress. Do not allow hazardous, dangerous or unsanitary conditions or public nuisances to develop or persist on the site.

B. Easements: obtain necessary easements for temporary facilities when required.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. General: provide new materials and equipment or undamaged previously used materials and equipment in serviceable condition. Provide materials and equipment suitable for the use intended.

B. Water: provide potable water approved by local health authorities.

C. First aid supplies: comply with governing regulations.

D. Fire extinguishers: provide hand-carried, portable UL-rated, class “A” fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable UL-rated, class “ABC” dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

E. Work zone traffic control: comply with IDOT 701 and 702.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate facilities where they will best serve the Project and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY INSTALLATION

A. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.3 TEMPORARY CONSTRUCTION AND SUPPORT FACILITY INSTALLATION

A. Storage and fabrication sheds (optional): install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces on the site.

B. Sanitary facilities: comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the Project’s needs.

1. Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

2. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.

C. Temporary enclosures: provide temporary enclosure for protection of construction in progress and completed from exposure, foul weather, other construction operations and similar activities.

1. Where heat is needed, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and materials drying or curing requirements to avoid dangerous conditions and effects.

D. Temporary signs: prepare and install signs to inform the public and persons seeking entrance to the Project. Support on the posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.

E. Collection of disposal of waste: collect waste from project site daily. Comply with requirements of NFPA 241 for removal of combustible waste materials and debris. Enforce requirements strictly. Do not hold materials more than seven days during normal weather and three days when the temperature is expected to rise above 80 degrees Fahrenheit. Handle hazardous, dangerous or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

3.4 SHORING, BRACING AND UNDERPINNING (as required)

A. Provide shoring and bracing necessary to protect existing buildings, streets, walkways, utilities and other improvements and excavation against loss of ground or caving embankments. Maintain shoring and bracing. Remove temporary shoring and bracing when no longer required.

B. Whenever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system, adequately anchored and braced to resist earth and hydrostatic pressures.

C. Shoring systems retaining earth on which the support or stability of existing structure is dependent must be left in place at completion of work.

D. Maintain bracing until structural elements are rebraced by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

E. Remove sheeting, shoring and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities and utilities.

F. Repair or replace as acceptable by Owner, adjacent work damaged or displaced through the installation or removal of shoring and bracing work.

3.5 SECURITY AND PROTECTION FACILITIES

A. Barricades, warning signs and lights: Comply with IDOT 701,702 and local code requirements. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.

B. Environmental protection: provide environmental protection as outlined in Section 01 56 00 – TEMPORARY ENVIRONMENTAL CONTROLS.

C. Site security to be provided by the Contractor as required.

3.6 OPERATION, TERMINATION AND REMOVAL

A. Supervision: enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

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 a day basis where required to achieve indicated results and to avoid the possibility of damage.

C. Termination and removal: remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

D. Materials and facilities that constitute temporary facilities are the property of the Contractor.

END OF SECTION 01 50 00

SECTION 01 56 00

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Contractors shall:

1. Provide controls over environmental conditions at the construction site and related areas under the Contractor's control.
2. Remove physical evidence of temporary controls at completion of work or as directed.

1.2 RELATED WORK

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.3 QUALITY CONTROL

A. Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control - "Green Book"

1.4 DUST CONTROL

A. Provide dust control materials to minimize dust from construction operations. Prevent air-borne dust from dispersing into the atmosphere.

B. 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.

1.5 WATER CONTROL

A. Control surface water to prevent damage to the project, the site or adjoining properties.

1. Control fill, grading and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; direct drainage to proper runoff.

B. Provide, operate and maintain hydraulic equipment of adequate capacity to control surface water.

C. Dispose of drainage water in a manner to prevent flooding, erosion sitting or runoff of silt or sediment or other damage to all portions of the site or to adjoining areas.

1.6 RODENT CONTROL

A. Provide rodent control to prevent infestation of construction or storage areas.

1. Use methods and materials, which will not adversely affect conditions at the site or on adjoining properties.
2. Maintain site in clean condition.

a. Dispose of garbage and debris.
b. Do not keep items on site which attract rodents.

3. When the use of rodenticides is deemed necessary, submit a copy of proposed program to the Owner. Clearly indicate:

a. Areas to be treated.
b. Rodenticides to be used, with copy of manufacturer's current printed instructions.
c. Pollution preventative measures to be employed.
d. Illinois licensed pesticides applicator.

1.7 DEBRIS CONTROL

A. Maintain all areas under Contractor's control free of extraneous debris.

B. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas or along access roads and haul routes.

1. Provide containers specified in SECTION 01 71 00 - CLEANING for deposit of debris.
2. Prohibit overloading of trucks to prevent spillages on access and haul routes.

a. Provide daily inspection of traffic areas to enforce requirements.

C. Schedule collection and disposal of debris is specified in SECTION 01 71 00 - CLEANING.

1. Provide additional collections and disposals of debris whenever regular schedule is inadequate to prevent accumulation.

1.8 POLLUTION CONTROL

A. Prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.

B. Provide equipment and personnel, perform emergency measures to contain all spillages, and to remove contaminated soils or liquids. Excavate and dispose of all contaminated earth off-site. Replace with suitable compacted fill and topsoil.

C. Take special measures to prevent harmful substances from entering public waters or spilling onto the ground. Prevent disposal of wastes, effluents, chemicals or other such substances adjacent to streams, or in sanitary or storm sewers, including waste from portable toilets.

D. Provide systems for control of atmospheric pollutants.

1. Prevent toxic concentrations of chemicals.

2. Prevent harmful dispersal of pollutants into the atmosphere.

1.9 EROSION CONTROL

A. Plan and execute construction and earthwork in a manner to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.

1. Minimize the areas of bare soil exposed at one time.
2. Provide temporary control measures such as berms, dikes and drains.
3. Provide temporary control measures to prevent silting or runoff of silt or sediment from site.

B. Construct fills and waste areas by selective placement to eliminate surface silts or clays which will erode.

C. Periodically inspect earthwork to detect evidence of the start of erosion. Apply corrective measures to control erosion.

PART 2 - PRODUCTS

(NOT APPLICABLE)

PART 3 - EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 56 00

SECTION 01 60 00

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section 01 30 00 - SUBMITTALS.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms such are self-explanatory and have well recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
2. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

1.4 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

1. When specified products are available only from sources that do not or cannot produce a quantity adequate to complete project requirements in a timely manner, consult with the Owner for a determination of the most important product qualities before proceeding. Qualities may include attributes relating to visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources that produce products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. The Contractor is responsible for providing products and construction methods that are compatible with products and construction methods of subcontractors.
2. If a dispute arises between the general Contractor and subcontractors over concurrently selectable, but incompatible products, the Owner will determine

which products shall be retained and which are incompatible and must be replaced.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.

D. Manufacturer’s Instructions

1. When contract documents specify that installation shall comply with manufacturer’s printed instructions, obtain and distribute copies of such instructions to all parties involved in the installation, including the Owner.
2. Maintain one set of complete instructions with the Project Record Documents at the job site during installation and until completion.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.
1. Schedule delivery to minimize long-term storage at the 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, or theft.
3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

B. Arrange for transportation and deliveries of materials and equipment in accord with approved current construction schedules and in ample time to facilitate inspection prior to installation.

C. Coordinate deliveries to avoid conflict with work and conditions at site:

1. Work of other contractors or Owner, or their use of premises.
2. Limitations of storage space.
3. Availability of equipment and personnel for handling products.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Comply with size, make, type and quality specified.
4. Manufactured and fabricated products:

    a. Design, fabricate and assemble in accord with best engineering and shop practices.
    b. Manufacture like parts of duplicate units to standard interchangeable sizes.
    c. Two or more items of the same kind shall be identical from the same manufacturer.
    d. All system parts shall be from the same manufacturer to the greatest extent practical.
    e. Adhere to equipment capacities, sizes and dimensions shown or specified unless variations are specifically approved by Change Order.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
2. Semi-proprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.

    a. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract's provisions concerning "substitutions" to obtain approval for use of an unnamed product.

3. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.

    a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.

6. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
7. Visual Matching: Where Specifications require matching an established Sample, the Owner's decision will be final on whether a proposed product matches satisfactorily.

    a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.

8. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Owner will select the color, pattern and texture from the product line selected.

C. Deliver products in undamaged condition in original containers or packaging, with identifying labels intact and legible.

D. Clearly mark partial deliveries of component parts or assemblies or equipment to permit easy identification of parts and to facilitate assembly.

E. Immediately on delivery, inspect shipment to assure:

1. Product complies with contract documents and Owner
2. Quantities are correct.
3. Containers and packages are intact and labels are legible.
4. Products are properly protected and undamaged.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS:

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

B. Provide equipment and personnel to handle products and equipment, including those furnished by the Owner. Prevent damage to products or packaging.

C. Provide additional protection during handling to prevent scraping, marring or otherwise damaging products, equipment or surrounding surfaces.

D. Handle products and equipment in manner to prevent bending or overstressing.

E. Lift packages, equipment or components only at designated lift points.

END OF SECTION 01 60 00

SECTION 01 63 00

SUBSTITUTIONS AND PRODUCT OPTIONS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base all bids on providing all products exactly as specified.

B. For products specified only by reference or performance standards, select any product which meets or exceeds standards, by any manufacturer, subject to the Owner's approval.

C. For products specified by naming several products or manufacturers, select any product and manufacturer named.

1.2 RELATED WORK

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Provisions and all other Divisions of the Project Manual, apply to this Section.

1.3 SUBSTITUTIONS, BIDDER/CONTRACTOR OPTIONS

A. Prior to Bid Opening: The Owner will consider written requests to amend the bidding documents to add products not specified provided such requests are received at least 10 calendar days prior to bid opening date. Requests received after that time will not be considered. When a request is approved, the Owner will issue an appropriate addendum not less than three (3) calendar days prior to bid opening date.

B. With Bid: A bidder may propose substitutions with his bid by completing the Product Substitution List in the Bid Form, subject to the provisions stated thereon. The Owner will review Proposed Product Substitution List of low bidder and recommend approval or rejection by the Owner prior to award of contract.

C. After Award of Contract: No substitutions will be considered after Notice of Award except under one or more of the following conditions:

1. Substitution required for compliance with final interpretations of code requirement or insurance regulations.
2. Unavailability of specified products, through no fault of the Contractor.
3. Subsequent information discloses inability of specified product to perform properly or to fit in designated space.
4. Manufacturer/fabricator refusal to certify or guarantee performance of specified product as specified.
5. When a substitution would be substantially to Owner's best interest.

1.4 SUBSTITUTION REQUIREMENTS

A. Submit three (3) copies of each request for substitution. Include in request:

1. Complete date substantiating compliance of proposed substitution with contract documents.

2. For products:

    a. Product identification, including manufacturer's name and address.
    b. Manufacturer's literature:

        1) Product description
        2) Performance and test data
        3) Reference standards

    c. Samples
    d. Name and address of similar projects on which product was used and dates of installation.

3. For construction methods:

    a. Detailed description of proposed method.
    b. Drawings illustrating methods.

4. Itemized comparison of proposed substitution with product or method specified.
5. Data relating to changes in construction schedule.
6. Identify:

    a. Changes or coordination required.
    b. Other contracts affected.

7. Accurate cost data on proposed substitution in comparison with product or method specified.

B. In making request for substitution, bidder/contractor represents:

1. He has personally investigated proposed product or method and determined that it is equal or superior in all respects to that specified.
2. He will provide the same guarantee for substitution as for product or method specified.
3. He will coordinate installation of accepted substitutions into the work, making all changes for work to be complete in all respects.
4. Cost data is complete and includes all related costs under his contract, but excludes:

    a. Owner's redesign.
    b. Administrative costs of Owner.
    c. Costs under separate contracts.

5. He will pay all additional costs and expenses for Owner and other contractors.

C. Substitutions will not be considered when:

1. They are indicated or implied on shop drawings or product data submittals without formal request submitted in accordance with this Section.
2. Acceptance will require substantial revision of contract documents.

PART 2 – PRODUCTS

(NOT APPLICABLE)

PART 3 – EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 63 00

SECTION 01 70 00

PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Substantial completion, final completion, closeout submittals, and application for final payment.

B. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:

1. Inspection procedures.
2. Project record document submittal.
3. Operating and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.
6. Final payment.

1.2 RELATED WORK

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.3 SUBSTANTIAL COMPLETION

A. When the Contractor considers the work substantially complete, Contractor shall submit written declaration to the Owner that the work, or designated portion thereof, is substantially complete. Include list of items to be completed or corrected.

B. Owner and Contractor will make an inspection within seven days after receipt of certification.

C. Should the Owner consider that the work is substantially complete:

1. The Owner will prepare and issue a Certificate of Substantial Completion, containing:

a. Date of Substantial Completion.
b. Punch list of items to be completed or corrected.
c. The time within which Contractor shall complete or correct work of listed items. All punch list items must be completed within 30 days of substantial completion.
d. Date and time Owner will assume possession of work or designated portion thereof.
e. Responsibilities of Owner and Contractor for:

(1.) Insurance
(2.) Utilities
(3.) Operation of mechanical, electrical and other systems.
(4.) Maintenance and cleaning.
(5.) Security

f. Signatures of Owner and Contractor

D. Should the Owner consider that work is not substantially completed:

1. The Owner shall immediately notify Contractor, in writing, stating reasons.
2. The Contractor shall complete work and send a second written notice to Owner, certifying that project, or designated portion of project, is substantially complete.
3 The Owner will re-inspect work.

1.4 FINAL INSPECTION

A. When the Contractor considers the work complete, the Contractor shall submit written declaration to the Owner that the work is complete. Contractor shall submit written certification that:

1. Contract documents have been reviewed.
2. Project has been inspected for compliance with contract.
3. Work has been completed in accord with contract.
4. Equipment and systems have been tested in the Owner's presence and are operational.
5. Project is completed, ready for final inspection.

B. The Owner will make final inspection within seven days after receipt of certification.

C. Should the Owner consider that work is finally complete in accord with Contract Document requirements, he shall request contractor to make project closeout submittals.

D. Should the Owner consider that work is not finally complete:

1. The Owner shall notify the Contractor, in writing, stating reasons.
2. The Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to the Owner certifying that the work is complete.
3. The Owner will re-inspect work.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: In accordance with requirements of SECTION 01 72 00 - PROJECT RECORD DOCUMENTS.

B. Deliver evidence of compliance with requirements of governing authorities.

C. Deliver Certificate of Insurance for products and completed operations. Certificate shall include a evidence that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days prior notice has been given to the Contractor. Contractor shall include a written statement that Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents.

D. Evidence of payments, release of liens

1. Consent of Surety to Final Payment.
2. Other data establishing payment or satisfaction of obligations including receipts, Contractor's releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and form as required by the City.

3. Separate releases of waivers of liens for subcontractors, suppliers and others with lien rights against property of Owner together with list of those parties.
4. Paid utility bills, if any.
5. An affidavit that payrolls, bills for materials and equipment and other indebtedness connected to the work for which the City or the City's property might be responsible or encumbered (less any amounts withheld by City) have been paid or otherwise satisfied.

1.7 INSTRUCTION

A. Instruct Owner's personnel in operation of all systems, mechanical, electrical and other equipment.

1.8 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit final statement of accounting to Owner.

B. Statement shall reflect all adjustments.

1. Original contract sum.
2. Additions and deductions resulting from:

    a. Previous change orders.
    b. Cash allowances.
    c. Unit prices.
    d. Other adjustments.
    e. Deductions for uncorrected work.
    f. Deductions for re-inspection payments.

3. Total contract sum, as adjusted.
4. Previous payments.
5. Sum remaining due.

C. The Owner will prepare final change order, reflecting approved adjustments to contract sum not previously made by change orders.

1.9 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit final application in accord with requirements of Conditions of Contract.

1.10 FINAL CERTIFICATE FOR PAYMENT

A. The Owner will issue final certificate in accord with provisions of Conditions of contract.

B. Should final completion be materially delayed through no fault of the Contractor, the Owner may issue a Semi-Final Certificate of Payment, in accord with provisions of Conditions of Contract.

PART 2 – PRODUCTS

(NOT APPLICABLE)

PART 3 – EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 70 00

SECTION 01 71 00

CLEANING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Contractor shall maintain premises and public properties free from accumulations of waste, debris, and rubbish, caused by construction operations.

B. At completion of work, Contractor shall remove waste materials, rubbish, tools, equipment, machinery and surplus materials, clean all sight-exposed surfaces and leave project clean and ready for occupancy.

1.2 RELATED WORK

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.3 SAFETY REQUIREMENTS

A. Standards: Maintain project in accord with following safety and insurance standards.

1. Occupational Safety and Health Administration (OSHA).

B. Hazards Control:

1. Store volatile wastes in covered metal containers and remove from premises daily.
2. Prevent accumulation of wastes which create hazardous conditions.
3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with Federal, State and local ordinances and anti-pollution laws.

1. Do not burn or bury debris, rubbish or other waste materials on project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
3. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Select and use all cleaning materials and equipment with care to avoid scratching, marring, defacing, staining or discoloring surfaces cleaned.

B. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.1 DURING CONSTRUCTION

A. Execute cleaning to ensure that grounds and public properties are maintained free from accumulations of waste materials and rubbish.

B. Wet down materials and rubbish to lay dust and to prevent blowing dust.

C. At reasonable intervals during progress of work, clean site and public properties, and dispose of waste materials, debris and rubbish.

D. Provide on-site metal containers for collection of waste materials, debris and rubbish.

E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.

F. Handle waste materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

G. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

3.2 FINAL CLEANING

A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer’s instructions.

B. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

C. Clean the Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.

1. Remove tools, construction equipment, machinery and surplus material from the site.
2. Clean exposed exterior 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.
3. Remove debris and surface dust from limited access spaces.
4. Remove labels that are not permanent labels.
5. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that can not be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over “UL” and similar labels, including mechanical and electrical name plates.
6. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
7. Leave the Project clean and ready for occupancy.

E. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

F. Broom clean paved surfaces; rake clean other surfaces on grounds.

G. Maintain cleaning until project, or designated portion thereof, is occupied by Owner.

END OF SECTION 01 71 00

SECTION 01 72 00

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Maintenance of Documents

B. Contractor shall:

1. At project site, maintain one (1) copy of:

(a.) Contract drawings.
(b.) Project Manual.
(c.) Interpretations and supplemental instructions.
(d.) Addenda.
(e.) Reviewed, approved shop drawings and product data.
(f.) Other modifications to contract.
(g.) Field test records.
(h.) All schedules.
(i.) Correspondence file.
(j.) Change Orders

2. Provide files and racks for document storage.
3. File documents in format in accord with Project Manual Table of Contents.
4. Maintain documents in clean, dry, legible condition.
5. Do not use record documents for field construction purposes.
6. Make documents available at all times for inspection by Owner.
7. Furnish one (1) additional as-built record set of contract documents at the completion of the project. This set is not to be the set kept and updated periodically at the job site, but a clean set free of extraneous markings, notations, and erasures showing on a record of final conditions. Provide as-built record set in both PDF and AutoCAD formats.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.3 MARKING DEVICES

A. Provide ballpoint pens, red color.

1.4 RECORDING

A. Label each document "PROJECT RECORD DOCUMENTS" in 2" high printed letters.

B. Keep record documents current, updated not less often than monthly.

C. Do not permanently conceal any work until specified information has been recorded.

D. Contract drawings: Legibly mark to record actual construction:

1. Depths of various elements of foundation in relation to adjacent ground elevations.
2. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
3. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
4. Field changes of dimension and detail.
5. Changes made by change order.
6. Details not on original contract drawings.

E. Specifications and addenda: Legibly mark-up each section to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
2. Changes made by change order or field order.
3. Other matters not originally specified.

F. Shop drawings: Maintain as record documents; legibly annotate drawings to record changes made after review.

1.5 SUBMITTAL

A. At completion of project, deliver record documents to Owner.

B. Accompany submittal with transmittal letter, in duplicate, containing:

1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each record document.
5. Certification that each document submitted is complete and accurate.
6. Signature of contractor, or his authorized representative.

PART 2 - PRODUCTS

(NOT APPLICABLE)

PART 3 - EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 72 00

SECTION 01 73 00

OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Contractor shall:

1. Compile product data and related information appropriate for Owner's maintenance and operation of products and equipment provided under the Contract.
2. Instruct Owner's personnel in operation and maintenance of products, equipment and systems.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.3 QUALITY ASSURANCE

A. Maintenance Manual Preparation: In preparation of Maintenance Manuals, use personnel thoroughly trained and experienced in operation and maintenance of the equipment or system involved.

1. Where written instructions are required, use personnel skilled in technical writing to the extent necessary for communication of essential data.
2. Where Drawings or diagrams are required, use draftsmen capable of preparing Drawings clearly in an understandable format.

B. Instructions for the Owner's Personnel: For instruction of the Owner's operating and maintenance personnel, use experienced instructors thoroughly trained and experienced in the operation and maintenance of the equipment or system involved.

1.4 SUBMITTALS

A. Form: Manufacturer's standard product or equipment data of same type and form furnished to manufacturer's maintenance personnel.

B. Provide sturdy manila or kraft envelope, properly labelled, of sufficient size to contain all submittals.

C. Submit one copy of data in final form at least fifteen days before final inspection. This copy will be returned within fifteen days after final inspection, with comments.

1. After final inspection make corrections or modifications to comply with the Owner's comments. Submit the specified number of copies of each approved manual to the Owner within fifteen days of receipt of the Owner's comments.

D. Form of Submittal: Prepare operating and maintenance manuals in the form of an instructional manual for use by the Owner's operating personnel. Organize into suitable

sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder.

E. Binders: For each manual, provide heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2" by 11" paper. Provide a clear plastic sleeve on the spine, to hold labels describing the contents. Provide pockets in the covers to receive folded sheets.

F. Text Material: Where written material is required as part of the manual use the manufacturer's standard printed material, or if it is not available, specially prepared data, neatly typewritten, on 8-1/2" by 11", 20 pound white bond paper.

G. Drawings: Where drawings or diagrams are required as part of the manual, provide reinforced punched binder tabs on the drawings and bind in with the text.

1.5 MANUAL CONTENT

A. Neatly typewritten table of contents for each volume, arranged in systematic order. Follow Project Manual format.

B. In each manual include information specified in the individual Specification Section, and the following information for each major component of equipment and its controls:

1. General system or equipment description.
2. Design factors and assumptions.
3. Copies of applicable Shop Drawings and Product Data.
4. System or equipment identification, including:

    a. Name of manufacturer.
    b. Model number.
    c. Serial number of each component.

5. Operating instructions.
6. Emergency instructions.
7. Wiring diagrams.
8. Inspection and test procedures.
9. Maintenance procedures and schedules.
10. Precautions against improper use and maintenance.
11. Copies of warranties.
12. Repair instructions including spare parts listing.
13. Sources of required maintenance materials and related services.
14. Manual Index.
15. Contractor, name of responsible principal, address and telephone number
16. List with each product, the name, address and telephone number of:

    a. Subcontractor
    b. Maintenance contractor, as appropriate.
    c. Identify area of responsibility of each
    d. Local supply source for parts and replacement.

C. Organize each manual into separate Sections for each piece of related equipment. As a minimum each manual shall contain a title page, a table of contents, copies of Product Data, supplemented by drawings and written text, and copies of each warranty, bond and service Contract issued.

D. General Information: Provide a general information Section immediately following the Table of Contents, listing each product included in the manual, identified by product

name. Under each product, list the name, address, and telephone number of the Subcontractor or installer, and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. In addition, list a local source for replacement parts and equipment.

E. Product Data: Where manufacturer's standard printed data is included in the manuals, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where more than one item in a tabular format is included, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation and delete references to information that is not applicable.

F. Written Text: Where manufacturer's standard printed data is not available, and information is necessary for proper operation and maintenance of equipment or systems, or it is necessary to provide additional information to supplement data included in the manual, prepare written text to provide necessary information. Organize the text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operating or maintenance procedure.

G. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems, or to provide control or flow diagrams. Coordinate these drawings with information contained in Project Record Drawings to assure correct illustration of the completed installation.

H. Do not use original Project Record Documents as part of the Operating and Maintenance Manuals.

I. Warranties, Bonds and Service Contracts: Provide a copy of each warranty, bond or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to be followed in the event of product failure. List circumstances and conditions that would affect validity of the warranty or bond.

1. Contractor, name of responsible principal, address and telephone number.
2. List of each product specified to be included, indexed to volume content.
3. List with each product, the name, address and telephone number of:

    a. Subcontractor.
    b. Maintenance contractor, as appropriate.
    c. Identify area of responsibility of each.
    d. Local supply source for parts and replacement.

J. Product Data:

1. Include only sheets pertinent to specific product.
2. Annotate each sheet to:

    a. Clearly identify specific product or part installed.
    b. Clearly identify data applicable to installation.
    c. Delete references to inapplicable installation.

K. Drawings:

1. Supplement product data with drawings to clearly illustrate relationship of component parts of equipment and systems and control and flow diagrams.

2. Coordinate drawings with information in Product Record Documents to assure correct illustration of completed installation.
3. Do not use Project Record Documents as maintenance drawings.

L. Written text to supplement product data for particular installation:

1. Organize in consistent format under separate headings for different procedures.
2. Provide logical sequence of instructions for each procedure.

M. Copy of each warranty, bond and service contract issued.

1. Provide information sheet for Owner personnel. Give:

a. Proper procedures in event of failure.
b. Instances which might affect validity of warranties or bonds.

1.6 MANUAL FOR MATERIALS AND FINISHES

A. Submit two (2) copies of complete manual in final form.

B. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.

C. Content for products, applied materials and finishes:

1. Manufacturer's data, giving full information on products.

a. Catalog number, size, composition.
b. Color and texture designations.
c. Information for re-ordering special-manufactured products.

2. Instructions for care and maintenance.

a. Manufacturer's recommendations for types of cleaning agents and methods.
b. Cautions against cleaning agents and methods detrimental to product.
c. Recommended cleaning and maintenance schedule.

D. Moisture-Protection and Weather-Exposed Products: Provide complete manufacturer's data with instructions on inspection, maintenance and repair of products exposed to the weather or designed for moisture-protection purposes.

E. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:

1. Applicable standards.
2. Chemical composition.
3. Installation details.
4. Inspection procedures.
5. Maintenance information.
6. Repair procedures.

PART 2 - PRODUCTS

(NOT APPLICABLE)

PART 3 - EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 73 00

SECTION 01 74 00

WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1. Warranties for the Work and products and installations of each Contractor shall be one (1) year unless specified otherwise on the Drawings or in the individual Sections of Divisions 2 through 16.

B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and Contractors required to countersign special warranties with the Contractor.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.3 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requires of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights or remedies.

1. Rejection of Warranties: The Owner reserves the rights to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the

Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

F. For specific warranty requirements related to landscape materials, refer to the applicable Section.

1.4 SUBMITTALS

A. Submit written warranties to the Owner prior to the date certified for Substantial Completion. If the Owner's Certificate of Substantial Completion designates a commencement date for warranties other that the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Owner.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner within fifteen days of completion of that designated portion of the Work.

B. Form of Submittal: At Final Completion, compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, Subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

C. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the project title or name, and the name of the Contractor.
3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS

(NOT APPLICABLE)

PART 3 - EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 74 00

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: All work necessary for the removal and disposal of buildings, portions of building, structures, foundations, piping, equipment and roadways, or any part thereof including masonry, steel, reinforced concrete, plain concrete, electrical facilities, and any other material or equipment shown or specified to be removed.

B. Basic Procedures and Schedule: Carry out demolition so that adjacent structures, which are to remain, are not endangered. Schedule the work so as not to interfere with the day-to-day operation of the existing facilities. Do not block doorways or passageways in existing facilities.

C. If hazardous materials are discovered during removal operations, stop work, and notify Engineer. Hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

D. Additional Requirements: Provide dust control and make provisions for safety.

1.2 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials become the Contractor's property and shall be removed from the site.

B. Recycle all recyclable demolition material and dispose at an approved facility all non-recyclable material.

1.3 SUBMITTALS

A. Provide all submittals, including the following, as specified in Division 1.

B. Site Inspection: Visit the site and inspect all existing structures. Observe and record any defects which may exist in buildings or structures adjacent to but not directly affected by the demolition work. Provide the Owner with a copy of this inspection record and obtain the Engineer's approval prior to commencing the demolition.

C. Quality Control Submittals (prior to commencement of onsite demolition):

1. Methods of demolition and equipment proposed to demolish structure. Demolition means and methods must be approved by the Owner and Owner's Structural Engineer.

2. Waste Management Plan to indicate the types of wastes to be removed from the project and the proposed reuse, recycling, treatment, and disposal locations. Include names and addresses of back-up reuse, recycling, treatment, and disposal facilities.

3. Copies of any authorizations and permits required to perform the work, including disposal/recycling facility permits.

D. Pre-Demolition Photographs or Videotapes: Show existing conditions in sufficient detail of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

E. Schedule of Demolition Activities:

1. Detailed sequence of demolition and removal work, with early and late starting and finishing dates for each activity. Ensure onsite operations are uninterrupted if applicable.

2. Interruption of utility services. Indicate how long utility services will be interrupted.

3. Coordination for shutoff, capping, and continuation of utility services.

4. Locations of proposed dust-and noise-control temporary partitions and means of egress.

5. Means of protection for items to remain and items in path of waste removal from building.

F. Disposal Records: Provide material shipping records and, or waste manifests (i.e., for offsite waste management) indicating receipt and acceptance of solid waste by the disposal facility.

1.4 QUALITY ASSURANCE

A. Limits: Exercise care to break concrete well for removal in reasonably small masses. Where only parts of a structure are to be removed, cut the concrete along limiting lines with a suitable saw so that damage to the remaining structure is held to a minimum.

B. Examination of Existing Conditions: Examine the Drawings for demolition and removal requirements and provisions for new Work. Verify all existing conditions

and dimensions before commencing Work. Visit the site and examine the existing conditions and get familiar with the character, extent and type of demolition and removal Work to be performed.

C. Submit any questions regarding the extent and character of the demolition and removal work in the manner and within the time period established for receipt of such questions during the bidding period.

D. Demolition Firm Qualifications: Engage an experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

E. Regulatory Requirements: Comply with governing United States Environmental Protection Agency (USEPA) and he Illinois Department of Public Health (IDPH) notification regulations before beginning demolition. Comply with local, state, and federal hauling and reuse, recycling, treatment, and disposal regulations.

F. Standards: Comply with ANSI A10.6 and NFPA 241.

G. Pre-demolition Conference: Conduct conference at the Site. Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be demolished.

2. Review structural load limitations of existing structure.

3. Review and finalize 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 demolition operations.

1.5 PROJECT CONDITIONS

A. The Owner, Engineers assume no responsibility for actual condition of buildings to be demolished.

B. Conditions existing at time of inspection for bidding purpose will be maintained by the Owner as far as practical.

PART 2 PRODUCTS

2.1 MATERIALS

A. All materials required to complete the work under this Section shall conform to the standards and requirements of local codes, ordinances, municipalities, regulatory

agencies, utility companies and other agencies having jurisdiction over the work to be performed.

PART 3 EXECUTION

3.1 EXAMINATION OF EXISTING DRAWINGS

A. Drawings of existing structures and equipment will be available for inspection at the office of the Engineer.

3.2 PROTECTION

A. General Safety: Provide warning signs, protective barriers, and warning lights as necessary adjacent to the work as approved or required. Maintain these items during the demolition period.

B. Existing Services: Notify affected utility companies before starting work and comply with their requirements. Mark location and termination of utilities prior to demolition. Undertake no demolition work until all mechanical and electrical services affected by the work have been properly disconnected. Cap, reroute or reconnect interconnecting storm sewers, piping or electrical services that are to remain in service either permanently or temporarily in a manner that will not interfere with the operation of the remaining facilities.

C. Hazards: Perform testing and air purging where the presence of hazardous chemicals, gases, flammable materials, or other dangerous substances is apparent or suspected and eliminate the hazard before demolition is started.

3.3 REGULATORY REQUIREMENTS

A. The Contractor is solely responsible for obtaining permits or approvals which may be required to perform the work of this section, including all costs, fees and taxes required or levied. Notify and obtain such permits or approvals from all agencies having jurisdiction over demolition prior to starting work including, but not limited to local, state, and federal agencies.

B. Comply with all applicable federal, state, and local safety and health requirements regarding the demolition of structures and other site features as applicable.

C. Notify the Engineer immediately upon discovery of any hazardous materials detected on site after Certificate of Abatement has been issued.

3.4 DEMOLITION REQUIREMENTS

A. Explosives: The use of explosives is not permitted.

B. Protection: Carefully protect all mechanical and electrical equipment against dust and debris.

C. Removal: Remove all debris from the structures during demolition and do not allow debris to accumulate in piles. Clean adjacent structures, facilities, and improvements of dust, dirt, and debris caused by demolition operations.

D. Access: Provide safe access to and egress from all working areas at all times with adequate protection from falling material. Access and egress shall include all state and local roadways within the project area.

E. Protection: Provide adequate scaffolding, shoring, bracing railings, toe boards and protective covering during demolition to protect personnel and equipment against injury or damage. Cover floor openings not used for material drops with material substantial enough to support any loads placed on it. Properly secure the covers to prevent accidental movement.

F. Lighting: Provide adequate lighting at all times during demolition.

G. Closed Areas: Close areas below demolition work to anyone while removal is in progress.

H. Material Drops: Do not drop any material to any point lying outside the exterior walls of the structure unless the area is effectively protected.

3.5 DISPOSAL OF MATERIALS

A. Final Removal: Remove all debris, rubbish, scrap pieces, equipment, and materials resulting from the demolition unless otherwise indicated. Take title to all demolished materials and remove such items from the site.

B. OWNER's Property: In addition to any items which may be shown, the following items remain the property of the OWNER. Remove carefully, without damage, all items listed or shown, and stockpile as directed.

C. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising in the air to the lowest practical level. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

D. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, and subsurface obstructions.

E. Coordinate selective demolition of items shown on the drawings.

3.6 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:

1. Perform all demolition in accordance with OSHA regulations.

2. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition work above each floor or tier before disturbing supporting members on lower levels.

B. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as shown.

2. Report discrepancies to Engineer before disturbing existing installation.

3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

C. Separate areas in which demolition is being conducted from other areas that are still occupied.

1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.

D. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

E. Remove existing work as indicated and as required to accomplish new work.

1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.

2. Remove items indicated on drawings.

F. Services: Remove existing systems and equipment as indicated.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.

2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.

3. Verify that abandoned services serve only abandoned facilities before removal.

4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

G. Protect existing work to remain.

1. Prevent movement of structure; provide shoring and bracing if necessary.

2. Perform cutting to accomplish removals neatly and as specified for cutting new work.

3. Repair adjacent construction and finishes damaged during removal work.

3.7 PIPELINE ABANDONMENT

A. When requested or required by the Engineer, existing pipeline shall be abandoned.

B. Pipelines:

1. Pipelines designated to be abandoned, but not removed, shall be excavated at the main, cut and properly capped or plugged at all open ends.

2. Fill the abandoned pipeline with flowable fill. Lines to be filled shall be capped or plugged at the downstream end, filled with the approved mixture, and capped or plugged at the upstream end.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 02 41 18

PAVEMENT REMOVAL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Furnishing labor, material, equipment and services necessary for pavements, sidewalk, curb, and base removal and disposal of materials as shown on the Drawings and as required in this Specification Section.

B. Related Work Specified In Other Sections Includes, But is Not Limited to, the Following:

1. Section 02 41 00 - Demolition
2. Section 31 23 16 - Excavation - Earth and Rock
3. Section 31 23 23 - Backfilling
4. Section 32 12 00 - Asphalt Paving
5. Section 32 13 00 - Concrete Paving

C. Special Requirements:

1. Protection: Provide protection barricades, maintain all lights and signals and other measures as required by federal, state, and municipal laws, for the full period of demolition operations and remove same when directed. In removing Work, perform all Work required to protect and maintain adjacent property, streets, alleys, sidewalks, curbs, and other structures remaining in place.

1.2 REFERENCES

A. IDOT Standard Specifications for Road and Bridge Construction.

B. The City of Evanston Municipal Code.

1.3 SUBMITTALS

A. Submit for review pre-construction photographs or videotape showing existing conditions of adjoining construction and site improvements, including finish surfaces, which might be misconstrued as damage caused by construction operations. Submit before demolition begins.

B. Submit for review the temporary protective Work plan in accordance with this Specification Section.

1.4 PROJECT CONDITIONS

A. Demolitions shall be coordinated with all trades and project phasing

B. Conduct site-clearing operations to ensure minimum interface with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from the governing agency.

C. Provide protections necessary to prevent damage to existing improvements, including Owner or County property. Restore any damaged improvements to their original condition.

1.5 EXISTING SERVICES

A. The indicated locations shown on the drawings are approximate from the best available record drawings. Exact locations shall be determined in the field prior to commencing the work.

B. Notify, in advance, any affected Utility Company for approval. Arrange and pay for disconnecting, removing, capping and plugging utility services, as required.

C. Place markers to indicate the location of disconnected services and identify on the Record Documents.

PART 2 PRODUCTS

2.1 MATERIALS

A. Backfill materials shall be in accordance with Specification Section 31 23 23.

PART 3 EXECUTION

3.1 GENERAL

A. Pavement must be removed in accordance with Sections 204 and 416 of the State Specifications.

B. All exposed concrete or bituminous concrete pavement to be cut with pavement saw prior to breaking, ensuring that a straight joint remains.

C. Equipment and methods for removing pavement or curbs will be such as to prevent cracking, shattering or spalling of the pavement remaining in place.

D. The bottoms of all excavations must be properly leveled and all loose materials removed from excavations. All wood, timber and organic materials that are exposed at the bottom of all excavations, to be removed and the area backfilled per Specification Section 31 23 23.

E. On completion of the demolition Work, excavation Work, and before acceptance by governing agency, clean the areas affected, including areas outside the limits of the Work area where permission to Work has been granted. Remove surplus construction material or debris resulting from the demolition Work and excavation work, and dispose of legally off the site.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 02 65 00

UNDERGROUND STORAGE TANK REMOVAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Specification section applies to all demolition, construction and renovation projects that require the removal, decommissioning, and destruction of underground storage tanks (USTs) in accordance with all applicable regulations.

B. Description of Work: The Contractor shall perform the work under this section in accordance with all local, state and federal rules and regulations including but not limited to Illinois Environmental Protection Agency (Illinois EPA), United States Environmental Protection Agency (USEPA), Illinois Office of the State Fire Marshal (OSFM), and Occupational Safety and Health Agency (OSHA) regulations. There are four existing 10,000-gallon USTs in the system (two tanks store diesel and two tanks store unleaded gasoline) currently serving the Evanston Service Center's North Fuel Island. Planned demolition/construction activities at the site include the removal of the four existing USTs in the system. Therefore, the Contractor shall perform the following.

1. Submit the UST removal application to the OSFM at least 30 days prior to the removal of the UST. The Owner will provide the Contractor with all required information to secure the UST removal permit.
2. Coordinate the UST removal schedule with the OSFM and City of Evanston Fire Inspector.
3. Pump-out and dispose of product and sludge prior to removal of the UST system from the site. Pump-out contaminated water and other miscellaneous liquids that may be present in the UST basin to facilitate the UST system removal.
4. Excavate and temporarily stockpile onsite the overburden and excavated soils above and around the UST sufficient to facilitate the UST removal. The excavated material shall be placed on and covered by plastic sheeting (6-mil minimum) sufficient to prevent stormwater runoff from impacting the site or storm drain catch basins.
5. Remove and dispose of all UST piping, ancillary equipment, electric conduit, and accessories related to the UST system.
6. Clean tank interiors and dispose of tank washwater as special waste.
7. Where the existing UST system is not backfilled by the proposed UST system, backfill the UST system excavation with the removed overburden and excavated soils temporarily stockpiled on site. Any remaining UST excavation void should be backfilled with virgin quarry stone to grade.
8. Backfill and compact excavation areas using approved backfill materials. Restore the surface impacted by the UST removal similar to match the surrounding finished surface.

1.02 DEFINITIONS

A. IEPA: Illinois Environmental Protection Agency.

B. Backfill: granular or cohesive material that is utilized to backfill the UST excavation to grade prior to the replacement of the paved surface

C. Connected Piping: all underground piping including valves, elbows, joints, flanges, and flexible connectors attached to the UST system through which regulated substances flow.

D. Owner's Representative: means the entity that will perform environmental oversight on behalf of the Owner.

E. Excavation Zone: the volume containing the tank system and backfill material bounded by the ground surface, walls, and floor of the pit and trenches into which the UST system is placed at the time of removal.

F. Hazardous Waste: any substance as defined by:

1. 40 CFR Part 261.
2. Illinois Environmental Protection Act 415 ILCS 5/3.220; and Section 809.103 of Title 35: Environmental Protection; Subtitle G: Waste Disposal; Chapter I: Pollution Control Board.
3. Section 3001 of the Resource Conservation and Recovery Act of 1976, P.L. 94-580.

G. IDOT: Illinois Department of Transportation.

H. Manifest: the form provided or prescribed by the IEPA and used for identifying name, quality, routing, and destination of special waste during its transportation from point of generation to the point of disposal, treatment, or storage.

I. Motor Fuel: petroleum or a petroleum-based substance that is motor gasoline, aviation gasoline, No. 1 or No. 2 diesel fuel, or any grade of gasohol, and is typically used in the operation of a motor engine.

J. Noncommercial Purposes: with respect to motor fuel means not for resale.

K. Non-hazardous Special Waste: any substance as defined in Title 35: Environmental Protection; Subtitle G: Waste Disposal; Chapter I: Pollution Control Board; Subchapter i: Solid Waste and Special Waste Hauling; Part 809: Non-Hazardous Special Waste Classifications; Subpart A: General Provisions; Section 809.103.

L. OSHA: Occupational Safety and Health Administration.

M. Operator: any person in control of, or having responsibility for, the daily operation of the UST system.

N. Petroleum UST System: an underground storage tank system that contains petroleum or a mixture of petroleum with de minimis quantities of other regulated substances. Such systems include those containing heating oils, motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents, and used oils.

O. Pipe or Piping: a hollow cylinder or tubular conduit that is constructed of non-earthen materials.

P. Regulated Substance: includes but is not limited to petroleum and petroleum-based substances comprised of a complex blend of hydrocarbons derived from crude oil through processes of separation, conversion, upgrading, and finishing, such as motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents, and used oils. This includes:

1. Any substance defined in section 101(14) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 (but not including any substance regulated as a hazardous waste under subtitle C), and
2. Petroleum, including crude oil or any fraction thereof that is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Q. Release: any spilling, leaking, emitting, discharging, escaping, leaching or disposing from an UST into surface/subsurface soils, groundwater or the environment.

R. User: the entity for which or on whose behalf the Owner has undertaken to cause the Work to be performed.

1.03 SUBMITTALS

A. The Contractor shall submit copies of the following to the Owner a minimum of seven (7) calendar days prior to scheduling a UST removal:

1. Equipment and methods for adjacent structure protection and UST removal procedures prior to start of any Work.
2. Proof of OSHA training in compliance with the Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) for workers who will be involved in the UST system removal.
3. Contractor's Site-Specific Health and Safety Plan. The plan shall comply with all OSHA requirements. The plan must be submitted to the Owner within 10 calendar days of issuance of the Notice-to-Proceed (NTP). The work shall be performed under the direct supervision of a trained, experienced site supervisor. The plan should at a minimum include the following:

    a. Name(s) of key personnel and alternates responsible for site safety.
    b. Describe the risks associated with each operation conducted.
    c. Type of personnel training and responsibilities and to handle the specific hazardous situations they may encounter.
    d. Describe the protective clothing and equipment to be worn by personnel during various site operations.
    e. Describe any site-specific medical surveillance requirements.
    f. Describe the program for the periodic air monitoring, personnel monitoring, and environmental sampling, if needed.
    g. Describe the actions to be taken to mitigate existing hazards to make the work environment less hazardous.
    h. Define site control measures including a site map.
    i. Establish procedures for personnel and equipment and transporting trucks to ensure that impacted soils are not tracked off site on to non-impacted areas of the site.
    j. Set forth the site Standard Operating Procedures (SOPs). SOPs are those activities that can be standardized (i.e., decontamination procedures and respirator fit testing).
    k. Set forth a Contingency Plan for the safe and effective response to emergencies.

4. Operating licenses and permits for each special waste hauler and details of hauling routes from the site to the disposal facilities.

5. Copies of all daily reports, transport manifests, disposal receipts and treatment records. Copies shall be required on a weekly basis.
6. Any air sampling data collected during the course of the Work, including OSHA compliance air monitoring.
7. Disposal information for any soil, product, sludge, tank washwater, and liquid removed from the site. This information should include, at a minimum, the following:

    a. Facility Name, Address, and Telephone Number.
    b. Site Contact.
    c. Permit Number.

8. Copies of UST(s) removal permit.
9. Copies of waste characterization analytical results for disposal of contaminated soil, product, sludge, tank washwater, and contaminated groundwater within one calendar day.
10. Certificate of Destruction from a steel reclamation facility within seven (7) calendar days after the tank removal.

1.04 SUBMITTAL REVIEW

A. Review of submittals or any comments made does not relieve the Contractor from compliance with the requirements of the specifications. The purpose of this check is to review for general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for confirming and correlating all quantities and dimensions; electing techniques of construction; coordinating the Work; and performing the Work in a safe and satisfactory manner, in compliance with all contract documents, specifications, and applicable laws and regulations.

B. The Contractor must not begin any Work applicable to this section until all required submittals have been reviewed and accepted by the Owner.

1.05 PROJECT CONDITIONS

A. Conditions of USTs: the Owner assumes no responsibility for actual condition of the storage tank to be removed.

B. Condition of Piping and Conduit: the Owner assumes no responsibility for actual condition of piping and conduit to be removed.

C. Contractor is totally responsible for handling and removal of all materials associated with UST system removal as required by local state and federal regulations.

D. Salvage Items: Reuse of items is not allowed unless specified otherwise. Storage tanks are to be rendered unusable before removing from job site.

E. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from the applicable governing agency and the Owner. Provide alternate routes around closed or obstructed traffic ways if required by the governing agency.

F. Damages: Promptly replace or repair any damage caused to adjacent pavement, utilities or facilities by removal operations at no additional cost. Work shall be performed to the satisfaction of the Owner and Owner's Representative.

G. Utility Services: Maintain existing utilities and protect against damage during removal operations. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Owner. Provide temporary services during interruptions to existing utilities as acceptable to the Owner.

1.06 QUALITY CONTROL

A. The removal of the UST system is governed by local, state and federal regulations and/or guidelines, which include, but are not necessarily limited to, the following:

1. City of Evanston Code and Regulations.
2. USEPA, 40 CFR Part 280, Subpart E, dated February 2023 or latest version.
3. Title 41 of Illinois Administrative Code (41 IAC): Fire Protection Chapter I: State Fire Marshal, Parts 174, 175, 176, and 177, dated October 2018 or latest version.
4. National Fire Protection Association Code.
5. All other USEPA, IEPA, City of Evanston, Illinois Department of Transportation (IDOT), and OSHA regulations.

1.07 RECORDKEEPING

A. The Contractor shall provide documentation of labor, equipment, materials, and laboratory analysis used for the removal and disposal of soils and liquids to the Owner and Owner's Representative on a weekly basis.

1.08 COORDINATION OF WORK

A. The Contractor shall coordinate and schedule the performance of Work with the least disruption as possible to the daily site activities.

B. The Contractor shall obtain a permit to remove the tank from the site from the OSFM within 48 hours of the discovery of any UST(s). The Contractor shall also schedule and coordinate the presence of the OSFM's representative(s) on site for the scheduled day of tank removal. The tank must not be removed from the ground without the OSFM representative(s) being present on site.

C. The Contractor shall provide the Owner and Owner's Representative advance written notice (minimum 48-hours) of the anticipated removal date. The Contractor must coordinate all UST removal activities with the Owner and Owner's Representative.

D. The Contractor shall cooperate with and coordinate Work progress with the Owner and Owner's Representative. Soils excavated from the UST basin shall be stockpiled near (2 feet or greater in accordance with safe excavation practices) the excavation or at an area deemed suitable by the Owner and Owner's Representative. The Contractor shall collect and analyze any soil samples from the UST excavation necessary to complete the OSFM site assessment form. The Contractor shall also visually inspect the underground storage tank for his own records. The Contractor shall record or otherwise document the closure activities. The excavation shall be

backfilled with the excavated soil and/or gravel the same day after removal and sampling activities unless directed by the Owner to do otherwise.

1.09 SPECIAL REQUIREMENTS

A. Qualifications

1. The UST Removal Contractor(s) shall be fully experienced and knowledgeable in the safe work procedures and regulatory requirements for removing, cleaning and disposal of underground storage tanks in accordance with all applicable local state and federal regulations.
2. The UST Contractor(s) shall be capable of performing all Work including providing necessary services, equipment, tools, labor and material for the removal, cleansing and disposal of underground storage tank and piping containing heating oil, and or petroleum, including the restoration of the site work area. The Contractor shall be capable of providing contingency services upon encountering soils or liquids that exceed 35 ILL. ADM. CODE SECTION 742, APPENDIX B, TABLE A; TIERED APPROACH TO CORRECTIVE ACTION OBJECTIVES (TACO) values for 35 ILL. ADM CODE 740 APPENDIX A Target Compound List (TCL) parameters when so directed by the Owner and/or Owner's Representative.
3. The UST Contractor(s), Subcontractor(s) and their employees shall be thoroughly trained in safe work practices, procedures, and regulatory requirements applicable to the removal, cleaning and disposal of underground storage tank systems containing heating oil and/or petroleum. The UST Contractor(s), Subcontractor(s) and their employees shall be responsible for removal, cleaning and disposal of tanks and associated soils, liquids and piping and shall be properly trained and hold current certifications. The UST Contractor(s), Subcontractor(s) and their employees on site shall have received a minimum of 40 hours of health and safety instruction in accordance with OSHA 29 CFR part 1910.120(e).
4. The UST Contractor(s) must be currently registered with the Office of the Illinois State Fire Marshal as a Remover of Underground Storage Tanks (Decommissioning) in accordance with Illinois Administrative Code, Title 41: Fire Protection, Chapter 1: Office of the State Fire Marshal, Part 170: Storage, Transportation, Sale and Use of Petroleum and Other Regulated Substances, as amended.

1.10 PROTECTION OF FACILITIES

A. The Contractor shall protect existing structures, services and utilities against damage. Exercise care to protect any and all of the User's, and adjacent properties including, but not limited to, equipment, utilities, buildings, landscaping and fencing. Any damage shall be repaired to the satisfaction of the User, or the User of the adjacent properties at the Contractor's expense.

B. The Contractor shall, in writing, bring to the attention of the Owner and Owner's Representative any obstacles, impairments or other items that may prohibit the performance of Work at least 72 hours prior to the start of Work.

C. The Contractor shall take all necessary precautions to protect structures, equipment, pavement, walks, utilities, etc. against movement or settlement during Work.

PART 2 - PRODUCTS

2.01 REMOVAL OF TANK CONTENTS

A. The Contractor shall furnish all necessary materials and equipment complying with local, state and federal Rules and Regulations to fulfill the scope of work described herein.

2.02 TANK REMOVAL

A. The Contractor shall furnish all necessary materials and equipment complying with local, state and federal Rules and Regulations to fulfill the scope of work described herein.

2.03 REMOVAL AND DISPOSAL OF CONTAMINATED SOILS AT A PERMITTED SUBTITLE D LANDFILL SITE

A. The Contractor shall furnish all necessary means, products, tools, and equipment required to fulfill the scope of work described in the Specifications as applicable for this Project.

B. Soil removal and disposal is addressed in further detail in 3.02.H of this Section.

2.04 BACKFILL MATERIALS

A. The Contractor shall submit a certification letter from the Owner/Operator of the backfill source that all imported material is virgin material mined directly from the source quarry.

PART 3 - EXECUTION

3.01 UST CONTENTS REMOVAL PROCEDURES

A. Pump out tank contents:
   1. Drain product from piping back into the tank, taking care to avoid spilling product. Use only explosion proof pumps or hand pumps.
   2. Remove petroleum products, sludge, water, and liquid wastes from the tank directly into haul truck or in an aboveground IDOT-approved container for offsite disposal. The suction hose shall be maneuvered along the tank bottom so that the maximum possible quantity of liquid is stripped from the interior.
   3. Liquids shall be temporarily stored in aboveground IDOT-approved containers or may be pumped directly into a tank truck for immediate disposal if the determination is made in advance. Waste removal from the site shall be performed only by properly licensed waste haulers in strict accordance with IEPA guidelines, including requirements for testing, laboratory analysis and manifesting. Coordinate location of temporary storage with the Owner and Owner's Representative.
   4. Residue from tanks shall be treated with caution. Tank residues shall be disposed of in accordance with all applicable state and federal laws and regulations. Provide documentation of the proper disposal of all tank product and wastes to the Owner and Owner's Representative.

3.02 UST REMOVAL PROCEDURES

A. Purge storage tanks of flammable and combustible gases:

1. Observing all required safety precautions, disconnect all piping and compounds, except for the vent pipe which is to remain connected until purging is completed. Temporarily plug all other openings so that all vapors shall be forced through the vent opening. Vapors shall be purged by one of the several methods listed in API/1604-87.
2. Instrument for detecting and measuring Lower Explosive Limits (LEL) and oxygen levels shall be always maintained and operated continuously at the job site when work is being performed in areas which are or may become hazardous. Instrument shall be properly calibrated according to the manufacturer's specifications and checked and maintained accordingly.
3. OSHA standards for confined space entry and hazardous material regulations shall be strictly followed.
4. Disconnect and remove existing electrical lines to USTs pumps.

B. Excavate above and around the UST(s):

1. Remove and dispose of all pavement, concrete, and debris associated with the UST.
2. The Contractor shall be responsible for locating all existing utilities, which will be encountered during removal operations. The Contractor shall protect the utilities as required to complete the Work.
3. Excavate soil above and around tanks. Excavating area shall be large enough to uncover the profile of the tank and piping to complete removal.
4. Excavate and temporarily stockpile onsite the overburden and excavated soils above and around the UST sufficient to facilitate the UST removal. The excavated material shall be placed on and covered by plastic sheeting (6-mil minimum) sufficient to prevent stormwater runoff from impacting the site or storm drain catch basins.
5. After the UST has been removed, the Contractor shall collect and analyze any soil samples from the UST excavation necessary to complete the OSFM site assessment form.

C. Storage tank removal:

1. Check tanks for combustible gases. Purge tanks again as necessary.
2. Remove all associated tank piping, and tank hold down components including straps and concrete dead-man.
3. Remove tank in accordance with API recommended practice 1604.
4. After tank(s) have been removed from the ground, place the tank on a stable level surface for inspection.

D. Storage tank cleaning:

1. Cut holes in tanks using non-sparking tools to facilitate tank cleaning. Only cold cut equipment shall be used. The total surface area of all the holes shall be a minimum of 2% of the total surface area of the tank, or minimum of 9 square feet each opposite side or end. The Contractor shall have fire extinguishers on-site during cutting of tanks.
2. Clean tanks in accordance with API recommended practice 2015.
3. UST removed from the excavation zone shall be cleaned on-site the day of removal. The tank will then be temporarily stored on-site until proper disposal arrangements are made.

E. Disposal of tank cleaning washwater:

1. The Contractor shall submit samples of tank cleaning washwater and sludge to an independent laboratory for analysis as required by disposal facility. Submit copies of the analytical report and chain-of-custody form to the Owner and Owner's Representative.
2. Transporter of tank cleaning washwater and sludge shall be an Illinois licensed special waste hauler. The disposal facility shall be approved by the IEPA.
3. The Contractor shall prepare manifests required for transportation and disposal of washwaters and sludge. Submit copies of manifests to the Owner and Owner's Representative.

F. Disposal of storage tanks:

1. All tanks shall be taken to an appropriate disposal facility (e.g., scrap steel reclaimed or landfill). Tanks shall not be retained by the Contractor or reused in any manner.
2. Tanks shall be labeled with legible letters at least two inches high, as follows: TANK HAS CONTAINED (name of product)

3.

NOT VAPOR FREE
NOT SUITABLE FOR STORAGE OF FOOD
OR LIQUIDS INTENDED FOR HUMAN
OR ANIMAL CONSUMPTION
DATE OF REMOVAL: (month/day/year)

4. In addition, tanks which have or may have contained leaded fuels shall be labeled as:

TANK HAS CONTAINED LEADED GASOLINE
LEAD VAPORS MAY BE RELEASED IF
HEAT IS APPLIED TO TANK SHELL

5. Tanks, piping and components shall be removed from the site on the same day the site is excavated. If transportation on the day of removal is not possible, materials shall be secured on-site until disposal agreements are made.
6. Provide a certificate of destruction signed by the Contractor and a representative of the disposal/recycling facility to the Owner and Owner's Representative.
7. The excavation must be securely fenced to prevent access by unauthorized personnel until backfilled.

G. Storm Water Run-on/Run-off and Dewatering

1. The Contractor shall implement surface grading, pumping and/or combination of silt fence, sandbags, tarpaulins, plastic sheeting, and movable straw bales, as approved by the Owner and Owner's Representative, to prevent storm water runoff from entering the tank excavation or stockpiled material until the area has been backfilled.
2. Storm water that has come in contact with any portion of the contaminated soil as a result of the Contractor's failure to prevent contact with excavated soils or the excavation shall be collected and disposed of at the Contractor's own expense or as determined by the Owner and Owner's Representative.

H. Soil Removal and Disposal

1. All excavation shall be performed in accordance with OSHA requirements and guidelines.
2. In the event soils will be disposed off-site, the Contractor shall collect a sufficient amount of representative soil samples from the UST excavation for laboratory analysis to obtain a waste stream authorization from the disposal facility.
3. The Contractor shall submit the soil samples to the laboratory and pay for the cost of analyzing the constituents required by the disposal facility.

3.03 DISPOSAL OF MATERIALS

A. General: Remove daily from site accumulated debris, rubbish, and other materials resulting from piping and dispenser removal activities.

B. Removal: Dispose of materials removed from site in accordance with the Title 35 Illinois Administrative Code regulations. Transport and legally dispose of all materials and equipment. Comply with manifest regulations of all removed and disposed equipment and materials. Materials that shall be removed include, but are not limited to, the following:

1. Underground Storage Tanks
2. Piping
3. Soils and sludges
4. Paving materials, including but not limited to, concrete and asphalt
5. Product from storage tank and piping, and tank cleaning washwater
6. Free product and liquids if encountered during the UST removal process
7. Liquids/water from excavation and dewatering operations

3.04 SITE ASSESSMENT

A. Upon removal of the UST(s), the Owner's Representative may conduct a site assessment and collect soil samples as needed. A representative of the OSFM will also render an opinion as to whether a release has occurred.

B. If no release is confirmed, the Contractor shall complete removal of the tank, disposal of the tank, and backfill the excavation.

C. If a release is confirmed, the Contractor shall complete removal of the tank, dispose of the tank and backfill the excavation. Removal of additional impacted soils will be determined by the Owner or the Owners Representative.

D. The excavation shall remain open until all Contractor and Owner/Owner Representative sampling is completed. The Contractor is responsible for providing fencing and access control to prevent unauthorized access to the excavation by unauthorized personnel in accordance with applicable rules and regulations.

3.05 BACKFILLING OF THE EXCAVATION

A. The Contractor shall not backfill excavation areas without approval of the Owner and Owner's Representative. If the Contractor backfills the excavation area without obtaining approval from

the Owner and Owner's Representative, the backfill materials shall be excavated, transported and disposed of at a permitted Subtitle D Landfill, if required, at the Contractor's own expense.

B. The UST basin shall be backfilled in accordance with the project specifications or as directed by the Owner. The Contractor shall utilize suitable on-site materials or imported granular CA-6 stone consistent with Illinois DOT gradation. Compact backfill materials in accordance with the project specification.

C. For each off-site source of backfill materials, the Contractor shall provide to the Owner and Owner's Representative a certification letter from the Owner of the source that all imported material is virgin material mined directly from the source quarry.

D. Site Restoration: Restore the site according to the Architect/Engineer design plan, or as directed by the Owner.

3.06 DUST CONTROL

A. The Contractor shall control dust by all necessary means, including but not limited to covering trucks, stockpiles and open materials, watering haul roads, sweeping paved roads, and limiting the speed of all on-site vehicles.

END OF SECTION 02 65 00

(NO TEXT FOR THIS PAGE)

SECTION 03 10 00

CONCRETE FORMWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Provide concrete formwork for architectural concrete and structural concrete as specified to form concrete to profiles shown.

1. Architectural concrete is defined as concrete for the following exposed reinforced concrete surfaces:

a. Interior walls
b. Exterior walls to 6 inches below finish grade
c. Interior tank walls to 6 inches below normal operating water level
d. Beams
e. Columns
f. Undersides of floor slabs, roof slabs and stairs

2. Provide concrete finish with minimum smooth rubbed finish

3. Structural concrete is defined as all concrete that is not architectural concrete.

B. Related Work Specified in Other Sections Includes, but is Not Limited to, the Following:

1. Section 03 20 00 - Concrete Reinforcement
2. Section 03 15 00 - Concrete Accessories
3. Section 03 31 00 - Cast-In-Place Concrete

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ACI 318 - Building Code Requirements for Reinforced Concrete
2. ACI SP-4 - Formwork for Concrete
3. ACI 303R - Guide to Cast-in-Place Architectural Concrete

1.3 QUALITY ASSURANCE

A. Formwork Compliance: Use formwork complying with ACI SP-4 and ACI 303R. county

B. Mock-Up Erection: Erect, on the site where directed, a full-size mock-up of a cast-in-place wall or panel a minimum of 10 feet by 10 feet by 12 inches thick. Conform mock-up to requirements of ACI 303R.

C. Reinforce the panel with No 5 bars each way each face. Use form ties the same as those approved and with the form tie pattern similar to that approved. Use one face of the panel for smooth architectural concrete including "reveal" rustication with form joints.

1. Plug the tie holes as specified to determine the correct mortar mixture to match the panel color. If required, remove and replace tie hole plugging mortar until an acceptable color match is obtained. After the sample panels have been approved, intentionally damage and patch portions of the finish surface of the panels for the purpose of determining the correct mixture for patching mortar and patching technique to match the original panel color and surface.

2. Leave the approved mock-up on the job during construction as the standard of workmanship for the project. Remove mock-up from the premises after completion of the work.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.

1. Release Agent
   Magic Kote VOC by Dayton Superior
2. Form liners
   Dura-Tex by Dayton Superior
3. Rustications
   Symons Corporation, Des Plaines, IL

2.2 MATERIALS

A. Structural Concrete: Provide structural concrete form materials as follows:

1. Obtain approval for form material before construction of the forms.

2. Use a barrier type form release agent.

3. Use form ties, hangers, and clamps of such type that, after removal of the forms, no metal will be closer than one inch from concrete surface. Wire ties will not be permitted.

4. Provide ties with swaged washers or other suitable devices to prevent seepage of moisture along the ties. Leave the ties in place.

5. Use lugs, cones, washers, or other devices which do not leave holes or depressions greater than 7/8-inch in diameter.

B. Architectural Concrete: Provide architectural concrete form materials as follows:

1. Construct forms using 3/4-inch thick, High Density Overlay (HDO) Plyform, Class 1 or 2, meeting the requirements of the American Plywood Association. Use surfacing materials having a minimum weight of 60-60.

2. Use form coating and use thinner as recommended by manufacturer of the form coating, to coat cut or raw edges.

3. Use she-bolts with water seals for form ties for water containment structures.

4. Use form liners having one inch deep relief, elastomeric Dura-Tex in a fractured rib pattern to match existing. Furnish form liners in full height lengths with no horizontal joints, except where shown. Use wood for forms to be used with form liners.

5. Use elastomeric vertical "V-groove" rustications in the concrete bands and the horizontal rustication joints shown in the form liner concrete of the profile shown.

6. Use a barrier type VOC compliant form release agent.

PART 3 EXECUTION

3.1 DESIGN

A. Design Responsibility: Be responsible for the design, engineering and construction of the architectural concrete formwork and the structural concrete formwork. Conform the work to the recommendations of ACI SP-4 and ACI 303R.

B. Setting Time and Slag Use: The presence of fly ash or ground granulated blast furnace slag in the concrete mix for architectural concrete and structural concrete will delay the setting time. Take this into consideration in the design and removal of the forms.

C. Responsibility During Placement: Assume and take sole responsibility for adequate design of all form elements for support of the wet concrete mixtures specified and delivered.

D. Consistency: Design forms to produce concrete members identical in shape, lines and dimensions to members shown.

3.2 CONSTRUCTION DETAILS FOR FORMWORK

A. Structural Concrete Details: Follow the following details for all structural concrete:

1. Provide forms which are substantial, properly braced, and tied together to maintain position and shape and to resist all pressures to which they may be subjected. Make forms sufficiently tight to prevent leakage of concrete.

2. Determine the size and spacing of studs and wales by the nature of the work and the height to which concrete is placed. Make forms adequate to produce true, smooth surfaces with not more than 1/8-inch variation in either direction from a geometrical plane. Provide horizontal joints which are level, and vertical joints which are plumb.

3. Supply forms for repeated use in sufficient number to ensure the required rate of progress.

4. Thoroughly clean all forms before reuse and inspect forms immediately before concrete is placed. Remove deformed, broken, or defective forms from the work.

5. Provide temporary openings in forms at convenient locations to facilitate cleaning and inspection.

6. Coat the entire inside surfaces of forms with a suitable form release agent just prior to placing concrete. Form release agent is not permitted on the reinforcing steel.

7. Assume and take responsibility for the adequacy of all forms and remedying any defects resulting from their use.

B. Architectural Concrete Details: Follow the following details for all Architectural Concrete:

1. Conform all construction details for formwork to “Construction Details for Formwork,” subsections A1, A2, A3, A4, A6 and A7 and the requirements of this section.

2. Thoroughly clean and lightly recoat HDO plywood panels before each additional use. Do not use forms more than three times.

3. Install form liners and rustication strips in strict accordance with the manufacturer’s written instructions and recommendations. Clog the ends of the form liner pattern and tape all form joints and edges using 1/8-inch thick by 3/4-inch wide foam tape centered on the joints, then caulk in accordance with the manufacturer’s recommendations each time forms are set.

4. Install forms for smooth concrete in such a manner that there will be no horizontal form joints and align the forms so that vertical joints occur only at "V-Groove" rustications. Space form ties in a uniform pattern vertically and horizontally. Position form ties in smooth concrete bands and in panels between "reveal" rustications, if any.

5. Erect beam and girder soffits with a camber of 1/2-inch in 20 feet and sufficiently braced, shored, and wedged to prevent deflection. Clamp column sides in accordance with this specification with metal column clamps, spaced according to the manufacturer's directions.

6. Provide external angles of walls, beams, pilasters, columns, window openings and girders with 3/4-inch bevel strips.

7. Give surfaces of concrete panel forms one thinned coat of form film.

8. Apply the release agent in strict accordance with the manufacturer's instructions.

3.3 FORM REMOVAL

A. General: Do not remove forms, form ties and bracing for structural and architectural concrete until concrete has gained sufficient strength to carry its own weight and anticipated imposed loads. Leave forms in place for the minimum number of days indicated in ACI 347 unless specific permission of the CONTRACTOR's Registered Professional Engineer is provided in writing.

B. Structural Concrete Form Removal: Do not remove forms for structural concrete until the concrete has hardened sufficiently to support its own load safely, plus any superimposed load that might be placed thereon. Leave the forms in place for the minimum length of time indicated below or until the concrete has reached the minimum strength indicated as determined by testing, whichever time is reached first.

1. The times indicated represent cumulative days or hours, not necessarily consecutive, during which the air surrounding the concrete is above 50 degrees F. These times may be decreased if reshores are installed.

		Minimum Time	Minimum Strength (psi)
a.	Columns	12 hrs.	1300
b.	Columns	12 hrs.	1300
c.	Side forms for girders and beams	12 hrs.	1300
d.	Walls	12 hrs.	1300

		Minimum Time	Minimum Strength (psi)
e.	Bottom forms of slabs		
	Under 10 feet clear span	4 days	2300
	10 to 20 feet clear span	7 days	2700
	Over 20 feet clear span	10 days	2900
f.	Bottom forms of beams and girders		
	Under 10 feet clear span	7 days	2700
	10 to 20 feet clear span	14 days	3000
	Over 20 feet clear span	21 days	3500

2. Increase form removal times as required if concrete temperature following placement is permitted to drop below 50 degrees F or if fly ash or ground granulated blast furnace slag is used in the concrete mix.

3. Withdraw the removable portion of form ties from the concrete immediately after the forms are removed. Clean and fill holes left by such ties with grout as specified in Cast-In-Place Concrete, Subsection Structural Concrete Surfaces.

4. Plug tie holes flush with the surface using portland cement mortar. Prewet tie holes with clean water and apply a neat cement slurry bond coat. Densely tamp mortar of a dry-tamp consistency into the tie holes exercising care so as not to smear mortar onto the finished concrete surface. Include sufficient white cement in the mortar mix to cause the plugged holes to blend in with the adjacent surfaces. Make sample patches with different mixes to assure that this requirement is met.

C. Architectural Concrete Form Removal: Remove forms for architectural concrete in accordance with the above subsection 3.03 A and B, except that do not remove forms for vertical surfaces sooner than 12 hours nor longer than 36 hours after placement of concrete.

3.4 RESHORING

A. Reshoring Method: Develop a system for reshoring and early removal of forms, in the event early stripping of forms becomes necessary. Include details and schedules in this system for each element which is to be reshored.

B. Construction Load Support: Do not support construction loads upon any unshored portion of the structure exceeding the structural design loads.

3.5 TOLERANCES

A. Tolerance Limits: Design, construct and maintain concrete form and place the concrete to provide completed concrete work within the tolerance limits set forth in ACI SP-4.

3.6 SURVEY OF FORMWORK

A. Field Survey: Employ an engineer or surveyor to check by instrument survey the lines and levels of the completed formwork before concrete is placed and make whatever corrections or adjustment to the formwork are necessary to correct deviations from the specified tolerances.

B. Placement Surveying Requirements: Check formwork during the placement of the concrete to verify that the forms, braces, tie rods, clamps anchor bolts, conduits, piping, and the like, have not been knocked out of the established line, level or cross section by concrete placement or equipment.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 03 15 00

CONCRETE ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for providing concrete accessories shown and specified herein such as waterstops, dovetail anchor slots, cast-in-place reglets, inserts, joint filler, preformed joint seal, joint sealant and neoprene pads.

B. Products Installed: Waterstops, dovetail anchor slots, cast-in-place reglets, inserts, joint filler, preformed joint seal, joint sealant and neoprene pads.

C. Related Work Specified in Other Sections Includes, but is Not Limited to, the Following:

1. Section 03 10 00 - Concrete Formwork
2. Section 03 20 00 - Concrete Reinforcement
3. Section 03 31 00 - Cast-in-Place Concrete

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. AASHTO - Standard Specifications for Highway Bridges

2. ASTM A 240 - Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels

3. ASTM A 536 - Standard Specifications for Ductile-Iron Castings

4. ASTM D 412 - Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension

5. ASTM D 3545 - Test Methods for Alcohol Content and Purity of Acetate esters by Gas Chromatography

6. ASTM D 3575 - Test Methods for Flexible Cellular Materials Made From Olefin Polymers

7. CRD-C513 - Specifications for Rubber Waterstops

8. CRD-C572 - Specifications for Polyvinyl Chloride Waterstop

9. Fed. Spec. TT-S-00227 - Sealing Compound, Elastomeric Type, Multicomponent (for Calking, Sealing, and Glazing in Buildings and Other Structures)

10. Fed. Spec. TT-S-00230 - Sealing Compound, Elastomeric Type, Single Component (for Calking, Sealing, and Glazing in Buildings and Other Structures)

1.3 SUBMITTALS

A. General: Provide all Work-related submittals, including the following, as specified in Division 1.

B. Product Data and Information:

1. Manufacturer's Data and Specifications: Submit printed manufacturer's data and specifications for each item used on this project.

2. Samples: Provide one sample of each item used.

3. Joint Sealant and Preformed Joint Seal: Indicate special procedures, surface preparation and perimeter conditions requiring special attention. All products in contact with potable water, shall be "NSF Standard 61" certified. Submit certified material records indicating approval for use with potable water.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle all products and materials as specified in Division 1

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.

a. PVC Joint Filler No. 327 by A.C. Horn

2. Sealant Backup Material

a. Sealtight Backer Rod
b. Cera Backer Rod by WR Medows

3. Preformed Joint Seal

a. Evazote by BASF

4. Wedge Inserts

a. Type F-7 by Dayton Superior, Miamisburg, OH

5. Dovetail Anchor

a. A.A. Wire Products Co.

b. Dur-O-Wal Inc.

6. Flashing Reglets

a. Standard reglets by Beehive Anchoring System

2.2 MATERIALS

A. Extruded Waterstops: Provide waterstops made of extruded polyvinyl chloride unless otherwise shown or specified.

1. Do not use any reclaimed plastic material in their manufacture.

2. Provide plastic waterstops meeting the requirements of CRD-C572, except as modified herein. Provide a Shore A/10 durometer hardness between 73 and 79, the tensile strength not less than 1850 psi, and specific gravity not more than 1.38.

3. Unless otherwise shown, use waterstops for construction joints which are flat, at least 6 inches wide, and not less than 3/8-inch thick at the thinnest section. Provide these waterstops with ribbed longitudinal strips.

4. Unless otherwise shown, provide waterstops for expansion joints at least 9 inches wide and not less than 1/4-inch thick at the narrowest point and not less than 3/8-inch thick immediately adjacent to the center of the waterstop. Provide the waterstop with ribbed longitudinal strips with a 3/4-inch inside diameter hollow bulb center. Limit joint movement to 1/4-inch under a tensile force of not more than 500 pounds per lineal inch.

B. Stainless Steel Waterstops: Provide stainless steel waterstops where shown or specified and on all water tanks.

1. Fabricate stainless steel waterstops from ASTM A 240 Type 316, 20 gauge stainless steel, conforming to the dimensions and profiles shown.

2. Prefabricate and miter corners and intersections for all stainless steel waterstops. Make only butt joints in the field.

C. IExpansion Joint Filler: Use joint filler for all expansion joints.

1. Provide a closed cell polyethylene of the thickness shown.

D. Joint Sealant Requirements: Finish expansion joints with a joint sealant where shown or specified.

1. Joint sealant materials may be either a single component urethane compound meeting the requirements of Fed. Spec. TT-S-00230C, or a 2-component urethane compound meeting the requirements of Fed. Spec. TT-S-00227E, except as modified in this specification.

2. Provide the urethane sealant of 100 percent polymer, non-extended, containing no solvent, lime, or coal tar. Color as selected by the ENGINEER, but not black. Conform sealant properties to the following:

	Property	Value	Test Method
a.	Maximum final cure	3 days	--
b.	Minimum tensile strength	140 to 200 psi	ASTM D 412
c.	Minimum elongation	400%	ASTM D 412
d.	Modulus at 100% elongation	40-60 psi	ASTM D 412
e.	Shore A hardness	25-40	ASTM D 2240
f.	Solid content	98-100%	--
g.	Peel strength	20-40 lb/in.	Fed. Spec. TT-S-00230C Fed. Spec. TT-S-00227E
h.	Minimum recovery	80-90%	Fed. Spec. TT-S-00230C Fed. Spec. TT-S-00227E
i.	Initial tack-free cure	24-48 hrs.	Fed. Spec. TT-S-00230C Fed. Spec. TT-S-00227E

3. Provide primer as recommended by the manufacturer of the sealant, subject to approval.

4. Provide fillers and backup materials in contact with sealant which are nonimpregnated and free from asphalt, creosote, oil or extractable plasticizers. Use a backup material of a closed cell polyethylene foam rod with a diameter 1/4-inch larger than the joint width.

5. Conform material properties with the following:

	Property	Value	Test Method
a.	Density, pcf	2.8 to 3.4	ASTM D 3575 Suffix: W, Method A
b.	Water Absorption total immersion 3 months	0.02% by volume	ASTM D 3575 Suffix: L
c.	Tensile Strength	125 psi	ASTM D 3575 Suffix: T
d.	Elongation before breaking	255%	ASTM D 3575 Suffix: T
e.	Working Temperature	-94 to 160 F	--

E. Wedge Inserts: Make wedge inserts for 5/8-inch and 3/4-inch bolts of ductile iron conforming to ASTM A 536.

F. Dovetail Anchors: Provide dovetail anchors of one of the following types:

1. Dovetail anchors having a 3/16-inch by 1-inch by 1/2-inch stainless steel dovetail section with 3/16-inch diameter stainless steel wire.

2. Dovetail anchor slots of 24 gauge galvanized steel 1-inch by 1-inch by 5/8-inch throat. Fill anchor slots.

G. Flashing Reglets: Provide flashing reglets of 24 gauge galvanized steel foam filled reglets.

PART 3 EXECUTION

3.1 INSTALLING OF WATERSTOPS

A. Assembly of Extruded Waterstops: Prefabricate corners and intersections for all waterstops. Make only butt joints in the field. Miter and assemble corners and intersections with approved equipment, as described for field joints.

1. Make field joints by cutting the ends of the sections to be spliced so they will form a smooth even butt joint. Heat the cut ends with the splicing tool until the plastic melts. Press the two ends together until the plastic cools. Do splicing in a way that limits damage to the continuity of the ribbed strips.

2. Carry waterstops in the walls into lower slabs and join them to the waterstops in the slabs. Make all waterstops continuous. Set waterstops accurately to the position and line shown. Hold edges securely fixed in position at intervals of not more than 24 inches so that they will not move during the placing of the concrete. Do not drive nails through the waterstops.

B. Prefabricated Stainless Steel Waterstops: Prefabricate corners and intersections for all stainless steel waterstops. Make only butt joints in the field. Miter and weld corners and intersections.

1. Provide field joints having a nominal 1-inch lap joint, with the exposed edge welded or brazed on each side.

2. Make field joints with PVC waterstops as shown.

3. At expansion joints, seal the base of the expansion section of the waterstop with at least one layer of 2-inch wide duct tape.

4. Carry waterstops in the walls into lower slabs and join them to the waterstops in the slabs. Make all waterstops continuous. Set waterstops accurately to the position and line shown. Hold edges securely fixed in position at intervals of not more than 24 inches so that they will not move during the placing of the concrete. Do not drive nails through the waterstops.

C. Splices: Use splices made in the manufacturer's plant where possible for rubber waterstops.

1. Use a preformed tees and corners and splicing cement as recommended by the manufacturer when splices are made.

2. Carry waterstops in the walls into lower slabs and join them to the waterstops in the slabs. Make all waterstops continuous. Set waterstops accurately to the position and line shown. Hold edges securely fixed in position at intervals of not more than 24 inches so that they will not move during the placing of the concrete. Do not drive nails through the waterstops.

D. Joint Filler Placement: Place joint filler for expansion joints against the completed portion of the work before the concrete for the next section is placed.

1. Fasten the filler to the hardened concrete with a compatible adhesive in accordance with manufacturer's instructions. Extend the filler through the thickness of the wall or slab and make it flush with the finished surface, except where a preformed joint seal or joint sealant is shown.

2. In joints having a waterstop, fit the filler accurately on each side of the waterstop to prevent the intrusion of concrete.

E. Preparation of 2-Component Sealants: Mix 2-component joint sealant using a slotted paddle and slow speed mixer for 5 to 8 minutes, continually working paddle from top to bottom until the sealant color is uniform. Scrape down the side of the container and paddle blade several times during the mixing operation to ensure uniform mixing.

1. Properly prepare joint surfaces by removing all foreign matter and concrete laitance so that concrete surfaces are structurally sound, clean, dry, and free of all oil, grease, wax, waterproofing compounds or form release materials prior to the application of primer and sealant.

2. Prime all concrete joint surfaces and all surfaces exposed to water prior to sealing, with no exceptions. Prime all other surfaces as recommended by the manufacturer of the sealant. Provide the prime as recommended by the manufacturer of the sealant, subject to approval. Apply the primer by either

brushing or spraying on the joint surfaces. Apply and install the sealant within 2 to 24 hours after the application of primer.

3. For horizontal joints, install the sealant by pouring directly from a suitable shaped can or by flowing from a bulk-loading gun.

4. Fill vertical joints from a gun, starting from the bottom, to avoid bridging and the formation of air voids.

5. Fill overhead joints from a gun, by laying a bead along each side of the joint and then filling the middle. Immediately after installation, tool in the sealant in order to establish firm contact with joint surfaces and to provide a smooth sealant surface. Tool in accordance with the manufacturer's instructions.

6. Control joint depth with the use of joint fillers and backup materials. Make joint widths and sealant depths as shown. Do not exceed 1/2-inch for sealant depth.

F. Preformed Joint Seal Surface Preparation: Properly prepare joint surfaces by removing all foreign matter and concrete laitance so that concrete surfaces are structurally sound, clean, dry, and free of all oil, grease, wax, water-proofing compounds or form release materials.

1. Blast clean or saw cut all existing concrete surfaces to expose a clean bare concrete surface. Allow new concrete to be well cured, and attain a minimum of 80 percent of the specified strength before installing sealant.

2. Apply bonding adhesive, as recommended by the manufacturer to the concrete surfaces in strict compliance with the manufacturer's recommendations. Install the joint material under a compression of 25 percent and in one continuous operation, in accordance with manufacturer's recommendations. Do all splices and directional changes using heat welding method as recommended by the manufacturer.

G. Unbonded Joints: Use unbonded horizontal joints as shown or required where slabs of beams must be prevented from bonding to footings, walls, columns or other rigid parts of the structure.

1. Prevent bonding by use of structural grade neoprene pads placed over the bearing surface of the footing, wall or other supporting part of the structure so as to isolate it from the new concrete being placed.

H. Encasing Inserts: Encase wedge inserts, flashing reglets and dovetail anchor slots in the concrete as shown. Take special care to place and maintain them to the proper lines and grades and to compact concrete thoroughly around them to prevent the passage of water. Set these items before placing concrete and thoroughly brace them to prevent movement during the progress of the work. Provide dovetail anchor slots spaced not more than 16 inches apart for all concrete walls faced with masonry.

END OF SECTION

SECTION 032000

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for providing concrete reinforcement as shown and specified herein. Reinforcement includes all steel bars, wire and welded wire fabric as shown and specified.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 03 10 00 - Concrete Formwork
2. Section 03 31 00 - Cast-In-Place Concrete
3. Section 03 45 00 - Architectural Precast Concrete

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ACI SP66 - ACI Detailing Manual

2. ACI 318 - Latest edition "Building Code Requirements for Reinforced Concrete"

A. ASTM A 185 - Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

3. ASTM A 615/A615M - Deformed and Plains Billet-Steel Bars for Concrete

4. ASTM A 706/A706M - Low Alloy Steel Deformed Bars for Concrete Reinforcement

5. ASTM A 775/A775M - Epoxy Coated Reinforcing Steel Bars

6. AWS D1.4 - Structural Welding Code - Reinforcing Steel

1.2 ACTION SUBMITTALS

B. Provide all submittals, including the following, as specified in Division 1.

1. Product Data and Information: Submit manufacturers literature with product data, and material description of fusion bonded epoxy coating for reinforcement and reinforcement accessories, including manufacturer's recommendations for field touch-up of mars and cut ends.

2. CONTRACTORS' Shop Drawings: Submit checked Working Drawings, including bar lists, schedules, bending details, placing details and placing plans and elevations for fabrication and placing reinforcing steel conforming to "ACI Detailing Manual - 88".

    a. Do not bill wall and slab reinforcing in sections. Show complete elevations of all walls and complete plans of all slabs, except that, when more than one wall or slab are identical, only one such elevation or plan is required. These plans and elevations need not be true views of the walls or slabs shown. Bill every reinforcing bar in a slab on a plan. Bill every reinforcing bar in a wall on an elevation. Take sections to clarify the arrangement of the steel reinforcement. Identify all bars, but do not bill on such sections.

    b. For all reinforcing bars, unless the location of a bar is clear, give the location of such bar or bars by a dimension to some structural feature which will be readily distinguishable at the time bars are placed.

    c. Make the reinforcing steel placing drawings complete for placing reinforcement including the location of support bars and chairs, without reference to the design drawings.

    d. Submit Detailer certification that every reinforcing steel placing drawing and bar list is completely checked and corrected before submittal for approval.

    e. If, after reinforcing steel placing drawings and bar lists have been submitted for approval, a review reveals that the drawings and lists obviously have not been checked and corrected they will be returned for checking and correcting by the Detailer.

3. Samples: Submit the following samples when epoxy coated reinforcement is specified to be used.

    a. 12-inch long epoxy-coated steel reinforcing bar, of any size typical to this Project

    b. One of each type of epoxy-coated reinforcement accessory used on this Project

    c. 12-inch long, nylon coated tie wire

4. Certificates: Test certificates of the chemical and physical properties covering each shipment of reinforcing steel bars.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle all products and materials as specified in Division 1 (and as follows:)

1. Delivery Requirements: Have reinforcing steel delivered to the work in strongly tied bundles. Identify each group of both bent and straight bars with a metal tag giving the identifying number corresponding to the reinforcing steel placing drawings and bar lists.

2. Storage: Properly store all bars in an orderly manner, with all bars completely off the ground. Keep bars clean after delivery to the site of the work.

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1. Reinforcement to Be Welded: Welding procedure specification in accordance with AWS D1.4.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

C. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4.

PART 2 - PRODUCTS

1.4 MANUFACTURERS

A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.

1. Mechanical connections

a. Dowel Bar Splicer/Dowel-In System and Coupler Splice System of the Richmond Screw Anchor System

b. Cadweld Rebar Splice by Erico Products Inc.

c. Bar Grip Splice by Barsplice Products Inc.

1.5 MATERIALS

A. Steel Bars: Use new billet steel bars, deformed bars, meeting the requirements of ASTM A 615/A625M Grade 60 for reinforcing steel bars.

1. Roll all reinforcing steel bars with special deformations or identifying marks indicating the ASTM Specification and Grade.

2. Use bars free from defects, kinks and from bends that cannot be readily and fully straightened in the field.

3. Supply reinforcing bars in lengths which will allow convenient placement in the work and provide the required lap of joints as shown. Provide dowels of proper length, size and shape for tying walls, beams, floors, and the like together.

B. Epoxy Coating: Conform fusion bonded epoxy coated reinforcing steel bars to ASTM A 775/A775M when used. Leave portions of the reinforcing steel bars uncoated where mechanical connections are shown.

C. Welded Wire Fabric: Use welded wire fabric of the electrically welded type, with wires arranged in rectangular patterns, of the sizes shown or specified and meeting the requirements of ASTM A 185.

D. Supports and Accessories: Provide bar supports and other accessories and, if necessary, additional supports to hold bars in proper position while concrete is being placed.

1. Use side form spacers against vertical or sloping forms to maintain prescribed side cover and cross position of bars.

2. Use individual hi-chairs with welded cross ties or circular hoops to support top bars in slabs thicker than 8 inches.

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615, Grade 60, deformed.

B. Low-Alloy Steel Reinforcing Bars: ASTM A706, deformed.

C. Epoxy-Coated Reinforcing Bars:

1. Steel Bars: ASTM A615, Grade 60, deformed bars.
2. Epoxy Coating: ASTM A775 with less than 2 percent damaged coating in each 12-inch bar length.

D. Plain-Steel Welded-Wire Reinforcement: ASTM A1064, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.

B. Steel Tie Wire: ASTM A1064, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Plain, ASTM A884, Class A, Type 1, epoxy coated, with less than 2 percent damaged coating in each 12-inch wire length.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

E. Clean reinforcement in slabs to a vertical tolerance of plus or minus 1/4-inch. Place all other reinforcement to the tolerances given to ACI 318.

F. Cleaning: Have reinforcing steel delivered without rust other than that accumulated during transportation to the work. At all times, fully protect reinforcing steel from moisture, grease, dirt, mortar and concrete. Before being placed in position, thoroughly clean reinforcing steel of all loose mill scale and rust and of any dirt, oil, grease coatings, or other material that might reduce the bond. If there is a delay in depositing concrete, inspect and satisfactorily clean the steel immediately before the concrete is placed.

G. Bar Positioning: Place bars in the exact positions shown with the required spacing and cross wire bars securely in position at intersections to prevent displacement during the placing of the concrete. Fasten the bars with annealed wire of not less than 17 gauge or other approved devices.

H. Bar Extension Beyond Formwork: On any section of the work where horizontal bars extend beyond the length of the forms, perforate the form or head against which the work ends or at the proper places to allow the bars to project through a distance at least equal to the lap specified.

I. Unacceptable Materials: Do not place reinforcing steel with damaged, unsuitably bonded epoxy-coating or rusting. If approved, mars, exposed threads of mechanical connections and cut ends may be field coated with approved epoxy coating material.

J. Review of Placement: Have reinforcing placement reviewed by the ENGINEER before concrete is placed.

3.2 Welding - Not Approved: Do not use reinforcing INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

K. Locate and support reinforcement with bar assemblies made by welding of any kind, or accessories of any kind which require field welding to reinforcing bars.

L. Welding - Approved: Where welding of reinforcing steel is shown, AWS D1.4 "Structural Welding Code - Reinforcing Steel" applies.

M. Tension and Compression Lap Splices: Conform tension and compression lap splices to ACI 318 with all supplements. Avoid splices at points of maximum tensile stress wherever possible. Provide temperature bars with the clear spacing shown. Stagger all bar splices in hoop tension bars in circular tanks with not more than 50 percent of the bars spliced in any one direction. Have welded splices made by certified welders in accordance with AWS D1.4.

1. Welded Wire Fabric: Place welded wire fabric in the positions shown, specified or required to fit the work. Furnish and place suitable spacing chairs or supports, as specified for bars, to maintain the fabric in the correct location. Where a flat surface of fabric is required, provide flat sheets, when available. Otherwise reverse roll the fabric or otherwise straighten to make a perfectly flat surface before placing. Obtain approval for the length of laps not indicated minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.
3. Weld reinforcing bars in accordance with AWS D1.4, where indicated on Drawings.

G. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect and Structural Engineer.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel-reinforcement placement.
2. Steel-reinforcement welding.

END OF SECTION

SECTION 03 31 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Providing cast-in-place concrete as specified herein to form concrete to profiles as shown on the plans including the following work:

1. Setting of anchor bolts, base plates, floor grating and plate, frames, stop log grooves, and other steel members embedded in concrete as indicated

2. Furnishing and setting of sleeves, inserts and other embedded accessories for mechanical and electrical equipment.

3. Furnishing concrete fill for steel pan stair treads, landings and associated items.

B. Architectural Concrete: Architectural concrete is defined as concrete for the following exposed reinforced concrete surfaces:

1. Interior walls

2. Exterior walls to 6 inches below finish grade

3. Interior tank walls to 6 inches below normal operating water level

4. Beams

5. Columns

6. Undersides of floor slabs, roof slabs and stairs

C. Related Work Specified in Other Sections Includes, but is Not Limited to, the Following:

1. Section 03 10 00 - Concrete Formwork
2. Section 03 20 00 - Concrete Reinforcement
3. Section 03 15 00 - Concrete Accessories
4. Section 03 60 00 - Grout

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ACI 212 - Chemical Admixtures for Concrete
2. ACI 301 - Specifications for Structural Concrete for Buildings
3. ACI 303R - Guide to Cast-In-Place Architectural Concrete
4. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete
5. ACI 305R - Hot Weather Concreting
6. ACI 306R - Cold Weather Concreting
7. ACI 308 - Practice for Curing Concrete
8. ACI 503R - Use of Epoxy Compounds with Concrete
9. ASTM C 31 - Practice for Making and Curing Concrete Test Specimens in the Field
10. ASTM C 33 - Specifications for Concrete Aggregates
11. ASTM C 39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens
12. ASTM C 42 - Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
13. ASTM C 94 - Specifications for Ready Mixed Concrete
14. ASTM C 143 - Test Method for Slump of Hydraulic Cement Concrete
15. ASTM C 150 - Specifications for Portland Cement
16. ASTM C 157 - Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete
17. ASTM C 171 - Specification for Sheet Materials for Curing Concrete
18. ASTM C 172 - Practice for Sampling Freshly Mixed Concrete
19. ASTM C 173 - Test Method for Air Content of Freshly Mixed Concrete by Volumetric Method
20. ASTM C 309 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete

21. ASTM C 618 - Specification for Coal Fly Ash and Raw Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

22. ASTM C 881 - Specification for Epoxy-Resin-Base Bonding Systems for Concrete

23. ASTM C 989 - Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

24. ASTM C 1116 - Specification for Fiber-Reinforced Concrete and Shotcrete

25. ASTM E 1155 - Standard Test Method for Determination of F_F

26. ASTM C 1218 - Test Method for Water-Soluble Chloride in Mortar and Concrete

27. ASTM C 1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

1.3 SUBMITTALS

A. Provide all submittals, including the following, as specified in Division 1.

1. Notarized certificates of manufacture as evidence that the cement, fly ash and ground granulated blast furnace slag conform to the specified requirements. Include in these certificates the mill-test reports on the cement.

2. Samples of aggregates, sieve analyses and manufacturers data showing conformance to the specified requirements.

3. Concrete mix designs for each type of concrete.

4. Test reports for laboratory and field cured cylinders.

5. Air content tests in accordance with ASTM C 138 or C 173 with mix design data.

6. Drying shrinkage tests for each class of concrete with mix design data. Test shrinkage in accordance with Section 3.3.H.

7. Detailed field report records of ready-mixed-concrete.

8. Manufacturers' Literature: Material description and application or installation instructions for curing compound, vapor barrier, floor hardener, floor sealer,

epoxy adhesives, synthetic fibers, admixtures, polymer modified non-sag mortar, and corrosion-resistant coatings.

9. Certified reports of tests made for maximum water soluble chloride ion concentration of design mix hardened concrete.

10. Test reports of floor flatness (F_F) and floor levelness (F_L) conforming to ASTM E 1155.

1.4 QUALITY ASSURANCE

A. Codes: The following specific codes and standards apply:

1. ACI 318 - Latest Edition, "Building Code Requirements for Reinforced Concrete".

2. ASTM - as referred to in the various subsections herein.

B. Testing Requirements: Testing laboratory provided by OWNER is responsible for conducting tests as required in Division 1.

C. Testing Assistance: Cooperate with the laboratory personnel, provide access to Work, and manufacturer's operations. Provide and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used which require testing.

D. Architectural Concrete Mock-Up: Erect, on the site where directed, a full size mock-up of a cast-in-place wall or panel a minimum of 10 feet by 10 feet by 12 inches thick as shown. Conform mock-up to requirements of ACI 303R.

1. Reinforce the panel as shown. Use form ties the same as those approved and with the form tie pattern similar to that approved. Use one face of the panel for smooth architectural concrete (including “reveal” rustication.) (and the opposite face for form liner concrete.) Include form joints.

2. Plug the tie holes as specified to determine the correct mortar mixture to match the panel color. If required, remove and replace tie hole plugging mortar until an acceptable color match is obtained. After the sample panels have been approved, intentionally damaged and patch portions of the finish surface of the panels for the purpose of determining the correct mixture for patching mortar and patching technique to match the original panel color and surface.

3. Leave the approved mock-up on the job during construction as the standard of workmanship for the project. Remove mock-up from the premises after completion of the work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle all products and materials as specified in Division 1 (and as follows:)

1. Cement: Store cement delivered in bulk to the batching plant in weathertight bins and batch using an appropriate weighing device, in accordance with ASTM C 94.

a. Store cement in weathertight buildings, bins or silos which will exclude moisture and contaminants. Do not use cement that has deteriorated from storage. Retest, before use, cement stored for a period longer than 6 months after the previous testing and reject it if it fails to meet all of the specified requirements. Do not use accepted cement that has been in storage for more than one year from the time of original acceptance.

b. Store cement delivered to the job site in strong, well-made bags plainly marked with the brand, name of manufacturer and net weight. Reject packages received in a damaged condition.

2. Aggregates: Keep aggregates clean and free from all other materials during transportation and handling. Keep them separated from each other until measured in batches and placed in the mixer.

a. Stockpile aggregates in a manner to prevent segregation unless finish screening is provided at the batch plant.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cement Requirements: Provide a cement which is a domestic product from an approved source. Use standard portland cement meeting the requirements of ASTM C 150 Type I or Type II.

1. Provide portland cement used in the manufacture of concrete pressure pipe which does not have an air-entraining agent. Also, use a nonplastic (0 slump) mix if portland cement without air-entraining agent is used in the manufacture of concrete sewer pipe.

B. Cementitious Material Requirements:

1. Fly Ash Requirements: Provide fly ash with a uniform light color from a source approved by the ENGINEER and with cementitious properties conforming to the requirements of ASTM C 618 Class C or F, with the following exceptions:

Loss on ignition - 5 percent maximum

Sulfur trioxide - 4 percent maximum

Store fly ash at the concrete mixing plant separate from the cement and do not intermix cement and fly ash prior to being added to the concrete mix.

2. Slag Requirements: Provide ground granulated blast furnace slag with cementitious properties conforming to the requirements of ASTM C 989, Grade 120, from an approved local product for normal weight concrete. Provide material having a uniform light color. Do not intermix cement and ground granulated blast furnace slag prior to being added to the concrete mix.

C. Synthetic Fiber Requirements: Provide synthetic fibers for inclusion in Portland cement normal weight concrete of Carolan -RC nylon fibers as manufactured by Allied Signal Inc., Petersburg, VA or approved equal.

1. Provide synthetic fibers exhibiting the following material, dimensional and strength characteristics:

a. Material: Nylon (100 percent)

b. Weight: 6 to 8 Denier per filament

c. Filament diameter: 23 microns

d. Specific gravity: 1.16

e. Fiber length: 3/4-inch minimum

f. Melting point: 435 degrees F

g. Tensile strength: 130,000 psi

h. Young's modulus: 750,000 psi

i. Toughness: 125,000 psi

2. Provide synthetic fibers manufactured by extrusion to the dimensions specified and not produced by slitting or chopping of sheet material or any other process.

D. Fine Aggregate Requirements: Provide fine aggregate of natural sharp sand meeting the requirements of ASTM C 33 for normal weight concrete, except as modified herein. Provide fine aggregate subjected to the test for organic impurities that will not produce a color darker than standard.

1. Provide fine aggregate meeting the requirements of the soundness test set forth in Paragraph 7.1 of ASTM C 33. The exceptions stated in Paragraphs 7.2 and 7.3 do not apply.

E. Coarse Aggregate Requirements: Provide coarse aggregate consisting of crushed stone, processed from natural rock or stones, meeting the requirements of ASTM C 33 for normal weight concrete.

1. The limits for deleterious substances and physical property requirements given in Table 3 of ASTM C 33 apply for each concrete class designation without exception.

2. Grade coarse aggregate according to Size No. 467 or No. 57 in Table 2 of ASTM C 33 for Class C concrete and Size No. 57 for Class B concrete.

F. Lightweight Aggregate Requirements: Provide lightweight aggregate meeting the requirements of ASTM C 330 for Class E Concrete as defined in Section 2. Design Mix.

G. Admixture Use: Limit the use of admixtures to the following:

1. Air-entraining admixture conforming to ASTM C 260

2. Water-reducing admixture conforming to ASTM C 494 Type A

3. Water reducing set retarders conforming to ASTM C 494 Type D

4. Use water-reducing and set-retarding admixtures only after obtaining written permission. Provide test data indicating that the concrete containing the admixtures has improved workability and does not show any abnormal behavior such as premature stiffening or slump loss for at least 30 minutes after mixing has been completed, or any other abnormal differences when compared with concrete made without the admixture. Base such test data on fresh concrete from the proposed supplier, using batching equipment proposed for use on the project.

5. Do not use admixtures containing calcium chloride, thiocyanates or more than 0.05 percent chloride ion. Obtain written conformance to the above requirements and the chloride ion content of each admixture from the admixture manufacturer prior to mix design review.

6. When more than one admixture is used, dispense each admixture separately into the mix, and at different times during mixing, in accordance with the recommendation of ACI Committee 212. After system approval, make no changes in batching equipment or concrete constituents without approval.

H. Water: Use clean water in mixing concrete which does not contain deleterious amounts of acids, alkalis or organic materials, furnished only from water from approved sources.

I. Curing Covers: Provide water curing blankets consisting of an outer covering of burlap or cotton or other approved material, and needled, punched or sandwiched inner layer of cotton batting or other approved material, in all weighing not less than 20 ounces per square yard. Use curing blankets by Midwest Canvas Corporation, Chicago, Illinois, by Max Katz, Indianapolis, IN or approved equal.

1. Use curing water having a temperature that is within 20 degrees F of the concrete's surface temperature.

J. Waterproof Paper and Film: Provide waterproof paper or polyethylene film both meeting the requirements of ASTM C 171 for use as sheet material curing covers**.**

1. Provide waterproof paper consisting of one ply of an approved type of fiber, reinforced waterproof building paper, consisting of cross fibers embedded in asphalt, between two layers of waterproof building paper, the whole being combined under heat and pressure to form a monolithic sheet.

2. Provide polyethylene film consisting of white opaque sheeting manufactured from virgin resin and containing no scrap or additives. Do not use a film of less than 4 mils in thickness.

K. Under Slab Vapor Barrier with accessories as follows:

1. Vapor Barrier Membrane: Provide multi-layer polyolefin fabric, manufactured with ISO certified virgin resins, with the following properties:

Property	**ASTM Test**	**Result**
Water Vapor Barrier	ASTM E 1745	Class A
Water Vapor Transmission	ASTM E 96	Not Exceeding 0.006 grains/ft^2hr
Permeance Rating	ASTM E 96	Not Exceeding 0.01 perms
Puncture Resistance	ASTM D 1709	Minimum 2200 grams
Tensile Strength	ASTM D 882	Minimum 45.0 lbs/in^2

2. Seam Tape: Minimum 4-inch wide, high density polyethylene tape with pressure sensitive adhesive, having a maximum permeance of 0.3 perms as tested by ASTM E 96.

3. Pipe Boots: Construct pipe boots from vapor barrier material and pressure sensitive tape and/or mastic per manufacturer's instructions.

4. Mastic: Medium viscosity, water-based, polymer modified, anionic bituminous/asphalt emulsion, having a maximum permeance of 0.3 perms as tested by ASTM E 96.

5. Acceptable Manufacturers: Stego Industries, San Juan Capistrano, CA. Or approved equal. Or approved equal

6. Products:

   a. Stego Wrap (15 mils in thickness), Vapor Barrier
   b. Stego Tape
   c. Stego Mastic

L. Residual Acrylic Curing and Sealing Compound Membrane: Provide a clear curing and sealing compound: "Super Aqua-Cure VOX" by The Euclid Chemical Company; "Master Kure® N-Seal-HS" by ChemRex/ MBT®; or “Cure & Seal 1315” by Symons Corporation. Provide a compound of a clear styrene acrylate type, 25 percent solids content minimum, which shall have test data from an independent testing laboratory indicating a maximum moisture loss of 0.040 grams per square centimeter. when applied at a coverage rate of 300 square feet per gallon, in accordance with ASTM C 1315 Class A or Class B.

M. Dissipating Resin Type, Membrane Forming, Curing Compound: Provide a dissipating resin type curing compound, conforming to ASTM C 309 Type 1D Class B, "Kurez DR" with The Euclid Chemical Co., Resi-Chem Clear Cure by Symons or equal. Use film having a chemical break down of a four-to-six-week period.

N. Chemical Floor Hardener: Provide chemical floor hardener consisting of magnesium and zinc fluosilicate such as "Lapidolith as manufactured by L. Sonneborn Sons, Inc., "Saniseal" as manufactured by Master Builders Co., or Fluosilicate by Symons or equal.

   1. Alternatively, where chemical hardening is required, substitute a natural, nonmetallic aggregate surface hardener at the time the floor is placed, in which case omit the latter application of chemical floor hardener. Obtain the hardening by incorporating into the surface of the freshly floated concrete a dry shake of Master Builders Mastercron Pre-Mixed, Procron as made by Protex Industries, Inc., Hard Top as made by Symons Corporation or equal, at the rate as recommended by the manufacturer. Perform all preparation, application procedures, curing and precautions in strict compliance with the manufacturer's recommendations and instructions submitted for approval prior to use. Use this material for interior applications only and limit air content for the design mix to 3 percent.

O. Nonslip Aggregate Finish: Provide fused aluminum oxide grits, or crushed emery, as abrasive aggregate for nonslip finish with emery aggregate containing not less than 40 percent aluminum oxide and not less than 25 percent ferric oxide. Use material that is factory-graded, packaged, rust-proof, and non-glazing, and is unaffected by freezing, moisture, and cleaning materials.

P. Epoxy Adhesives: Provide epoxy adhesives as follows:

   1. Sikadur 32 Hi-Mod by Sika Corporation, Richmond, VA or Euco 452 MV by Euclid Chemical Co., Cleveland, OH, Rescon 649 by Rescon Technology Corporation or equal. Use a two component, solvent-free, moisture

insensitive, structural epoxy adhesive, conforming to ASTM C 881, Type I and II, Grade 2, Class B and C, epoxy resin adhesive.

2. Sikadur 31, Hi-Mod Gel by Sika Corporation, Richmond, VA or Euco No. 452 Gel by Euclid Chemical Co., Cleveland, OH, Rescon R306 by Rescon Technology Corporation or equal. Use a 2-component solvent-free, moisture insensitive, high modulus, high strength, structural epoxy paste adhesive, conforming to ASTM C 881, Type I and II, Grade 3, Class B and C, epoxy resin adhesive.

Q. Nonsag Mortar: Provide Polymer Modified Nonsag Mortar as follows:

1. Sikatop 123 by Sika Corporation, Richmond, VA, Rescon R626 by Rescon Technology Corporation or equal. Use a 2-component, fast setting, nonsag, patching mortar, specifically formulated for application by trowel on vertical and overhead surfaces.

R. Corrosion-Resistant Coating: Use Sika Armatec 110 by Sika Corporation, Richmond, VA, Rescon R-504 by Rescon Technology Corporation or equal as a corrosion-resistant coating.

2.2 DESIGN MIX

A. Concrete Mix Classifications: Furnish and place concrete of the type divided into various classes according to use and compressive strength.

1. Use Class A concrete for all precast concrete units.

2. Use Class B concrete for all reinforced concrete structures designed for high strength and water tightness; and for columns, walls, beams, slabs, stairs, and, in general, wherever formwork other than simple forms are required.

3. Use Class C concrete for all reinforced concrete structures designed for high strength and water tightness; and for bottoms of structures, electrical duct encasement, and, in general, where concrete is deposited directly on the bottoms of slopes of excavations and where only simple forms are required.

4. Use Class D concrete for low-strength concrete, plain or reinforced, used for work mats beneath structures, soil stabilization, pipe cradles and encasement, filling, and other similar purposes. Clean boulders or fragments of rock excavated during construction may be embedded in large volumes of Class D concrete to provide added bulk. Use care in placing the boulders or rock fragments so that there will be no voids in the concrete.

5. Use Class E concrete for sand/lightweight concrete slabs placed over metal decks.

B. Compressive Strength: Provide, as a minimum, the specified compressive strength of concrete in pounds per square inch for the classes previously described as follows. Designate the 28-day strength as f'_c.

Class	7-Day Test	28-Day Test
A	3,400	5,000
B	2,700	4,000
C	2,700	4,000
D	1,300	2,000
E	2,700	4,000

1. Proportion and produce concrete to provide an average 28-day compressive strength in excess of the specified compressive strength, f'_c. Base the required proportions on tests of cylinders made, cured and tested as specified.

2. Prepare mix designs for each type of concrete required and submit for approval. Concrete which will be placed by pumping methods will require a separate mix design and mix design approval, as described herein, in addition to the mix design approval required for other placement methods.

C. Concrete Proportions: Select concrete proportions to provide the required strength and durability and to provide workability and consistency so that the concrete can be worked into forms and around reinforcement without segregation or excessive bleeding.

1. Provide concrete for all structures which is watertight. Do not allow the maximum water-cementitious material ratio to exceed 0.45 by weight of the total cementitious constituent. Measure the quantity of water to be the total quantity, including free surface moisture contained in the aggregates.

2. Do not allow the amount of fly ash to exceed 20 percent by weight of the cement plus fly ash, while maintaining a minimum cement content of 450 pounds per cubic yard.

3. Do not allow the amount of ground granulated blast furnace slag contained in Class B and C concrete to exceed 30 percent by weight of the cement plus slag, while maintaining a minimum cement content of 450 pounds per cubic yard.

4. Provide Class B and C concrete which also contains a minimum of 1-pound of synthetic fibers per cubic yard. Conform fiber reinforced concrete to the requirements of ASTM C 1116 unless otherwise specified.

5. Establish concrete proportions including the water-cementitious material ratio on the bases of field experience or trial mixtures with the materials to be used in accordance with Section 5.3 of ACI 318.

6. Establish concrete proportions by trial mixtures method, in accordance with Section 5.3 of ACI 318. Any significant changes in the established proportions or any change in the source of any constituent shall require a new set of trial mixture tests. The average 28-day compressive strength for Classes B, C and E concrete shall exceed 5200 psi. This average strength may be reduced using the standard deviation techniques given in ACI 301 and 318 as sufficient field data becomes available for the given mix. The mix designs and the trial batch test data shall be submitted, for review and approval, a minimum of 60 days prior to the first concrete placement using that mix design.

7. Provide sand/lightweight concrete with a dry weight not more than 115 pounds per cubic foot.

8. All concrete with a minimum dimension of 3"-0" or greater shall be mass concrete in accordance with ACI 301 and meet the requirements of section 8.1.3. All concrete with a cement content of 550 pcy and a minimum dimension of 2'-6' shall be mass concrete in accordance with ACI 301 and meet the requirements section 8.1.3.

D. Air Entrainment:

1. Provide air entrained Class B and C concrete with an average total air content of 5 percent. Allow a tolerance of plus or minus 1.5 percent on air content as delivered.

E. Slumps: When tested in accordance with ASTM C 143, provide a concrete mix design with slumps within the following limits:

Concrete Placement	Minimum and Maximum Slump in Inches	
	Class B, C and E	Class D
Normal	3 to 4	3 to 5
Pumped	4 to 6	4 to 6

1. Base the mix design slump on the concrete mix with water reducing admixture. For production concrete, allow no more than 1-inch increase in slump by use of specified water reducing admixtures. Measure slump at the end of the hose for pumped concrete.

2. Grade the combined aggregates for the design mix such that when a sample of the mix is separated on No. 4 standard sieve, the weight passing the sieve is not less than 30 percent nor greater than 40 percent of the total, unless otherwise specified.

F. Chloride Ion Concentration: Provide a maximum water soluble chloride ion concentration, percent by weight of cementitious materials, with two 28 day tests of design mix hardened concrete as follows:

1. Cast-in place concrete, exposed to moisture, water or sewage in service 0.10.

2. Cast-in-place concrete that will be dry or protected from moisture in service 1.00.

G. Shrinkage Control: Select materials and proportion mix to achieve an average 21 day drying shrinkage less than:

1. 0.036% for liquid-containing structures.

2. 0.048% for all other structures.

Provide one test (3 specimens) for each design mix in accordance with Section 3.3.H.

H. Measurement and Mixing: Measure and mix concrete in accordance with the recommendations of ACI 304R, as modified.

1. Measure cement, and fine and coarse aggregates separately by weight by equipment providing an accuracy within one percent of the net load weighed. Measure cement and water within 1 percent accuracy by weight. Measure aggregates within 2 percent accuracy. Measure admixtures within 3 percent accuracy by weight.

2. Use weighing equipment meeting the requirements of the United States Bureau of Standards. Make available standard testing weights and other necessary equipment at all times for testing the equipment.

3. Mix concrete in a rotary, batch-type mixer of adequate design to produce a thorough mix, homogeneous in composition and uniform in color. Mix each batch of one cubic yard or less not less than 1-1/2 minutes after the last of the ingredients have been added to the mixer. Increase the mixing time 15 seconds for each cubic yard or fraction thereof.

2.3 CONCRETE WORKMATS

A. As a working base for all new, reinforced-concrete structural foundation elements supported on soil, rock, select fill, backfill stone, drainage stone and the like, provide a Class D concrete workmat having a minimum thickness of 2 inches.

2.4 READY MIX CONCRETE

A. Ready Mix Requirements: For ready-mixed concrete meet the requirements of ASTM C 94, except as modified in the following paragraphs, and subject the mix to all provisions herein relative to materials, strength, proportioning, consistency, and

testing. Article 18 of ASTM C 94, however, does not apply. In the event of low strengths, procedures outlined in Section 3.01 "Low Concrete Strength Test Results" apply.

B. Delivery: Provide the rate of delivery of the mixed concrete such that the interval between placing of fresh concrete in contact with concrete already placed from previous batches does not exceed 45 minutes. Do not allow the elapsed time between the introduction of mixing water to the cement and aggregates and depositing concrete in the work to exceed 60 minutes, including mixing and agitating time.

C. Agitation: Do not deliver concrete in non-agitating equipment.

D. Field Records: Prepare a detailed concrete field record in which the following information is identified:

1. Number of concrete batches produced.

2. Proportions of materials used.

3. Approximate location of final deposit of each batch in the structure.

4. Time and date of mixing and placing.

PART 3 EXECUTION

3.1 PLACING CONCRETE

A. General: Place concrete only in the presence of the RESIDENT PROJECT REPRESENTATIVE. Where the procedure is not specified, place concrete in accordance with the recommendations of ACI 304R.

B. Continuous Operation: Place no concrete after its initial set has occurred, and do not use re-tempered concrete under any conditions. Make concreting operations continuous until the section, panel, or scheduled placement is completed. Should the concreting operations be unavoidably interrupted, provide construction joints formed at proper locations as specified.

C. Minimum Handling: Convey and place concrete with minimum handling and deposit the concrete in the forms as close as possible to its final position and in no case more than 5 feet in a horizontal direction therefrom. Do not re-handle concrete.

D. Horizontal Layers: Place concrete in horizontal layers shallow enough so that the previous layer is still soft when the next layer is added and the two layers can be vibrated together. Do not exceed 18 inches in depth for each layer.

E. Use of Chutes: Deposit wall and column concrete through heavy duck canvas or galvanized steel chutes equipped with suitable hopper heads. Provide chutes of

variable lengths so that the free fall of concrete does not exceed 3 feet. Provide illumination where required, inside the forms so that the concrete is visible from the deck and runways at the point of deposit.

F. Protection Against Elements: Protect freshly placed exposed concrete against damage from the elements or other sources.

G. Hot Weather Placement: For placement of concrete during hot weather, follow the recommendations of ACI 305R.

1. Place no concrete if the temperature of the concrete at the time of placement exceeds 90 degrees F.

2. When the temperature of the concrete at the time of placement is consistently above 75 degrees F and a noticeable decrease in slump or an increase in mixing water demand occurs, use a retarding admixture, after obtaining written permission to do so.

3. Protect unformed surfaces of concrete placed during hot weather from drying by continuous moist curing for at least 24 hours. Start curing as soon as the concrete has hardened sufficiently to withstand surface damage. If moist curing is not carried beyond 24 hours, cover the surface while damp with a suitable heat-reflecting plastic membrane or spray exterior surfaces with a white pigmented dissipating curing compound in accordance with Section 3.5 Curing. Use curing water having a temperature that is within 20 degrees F of the concrete's surface temperature.

4. Protect formed surfaces of concrete placed during hot weather from drying as recommended in ACI 305 R.

H. Cold Weather Placement: For placement of concrete during cold weather, follow the recommendations of ACI 306R, except that set-accelerators will not be permitted.

1. Before placement of concrete, completely remove all ice, snow and frost from all surfaces to be in contact with the concrete. Do not place concrete on a frozen subgrade. Heat surfaces to be in contact with the concrete to a temperature as near as practical to that of the concrete being placed.

2. When mean daily temperatures at the site are below 40 degrees F provide concrete at a temperature, as placed, of not less than 50 degrees F, except for mass concrete provide a temperature of the concrete as placed of not less than 45 degrees F. Heat aggregates or mixing water or both to obtain these placement temperatures. Do not permit the concrete temperatures as mixed to exceed the placement temperature by more than 10 degrees F for air temperatures of 0 degrees to 30 degrees F, nor by more than 15 degrees F for air temperatures below 0 degrees F.

3. Maintain concrete in place at a temperature of 50 degrees F by keeping forms in place, covering with insulated blankets, heated enclosures or combinations of these for the following minimum time intervals, except that forms shall not be removed in less than the time specified in Section 03100.

a.	Footings and walls below grade and slabs on grade	2 days
b.	Exposed walls and columns carrying no load	3 days
c.	Exposed floor slab, beams and girders above grade and partially loaded	6 days

4. Protect exposed surfaces of new concrete from drying out. When dry heating is used for protection against low temperatures, cover exposed concrete surfaces with an approved sheet material or membrane as specified in Section 03310 subsection "Curing". Use water curing only if icing problems can be avoided. During periods of very cold weather, continue the protection against low temperature for an extended curing period as required to prevent freezing of the concrete.

5. Permit concrete which is to be exposed to freezing temperatures to undergo some drying just prior to and during the period of adjustment to ambient cold-weather conditions. When protection against low temperatures is removed, do not allow the resulting temperature drop in any part of the concrete to exceed 5 degrees per hour nor 40 degrees F for the first 24 hour period.

I. Concrete Embedment's:

1. Encase pipes, anchor bolts, sleeves, steps, castings, floor drains, manhole frames, cast-in reglets, dovetail anchor slots, and other inserts in concrete as shown. Take special care to place and maintain them to the proper lines and grades and to compact concrete thoroughly around them to prevent the passage of water. Insofar as possible, set them before placing concrete and thoroughly brace to prevent movement during the progress of the work.

2. Space dovetail anchor slots vertically not more than 16 inches apart on all concrete walls faced with masonry.

3.2 VIBRATING CONCRETE

A. Use of Vibrators: Consolidate all concrete by means of mechanical internal vibrators applied directly into the concrete in a vertical position in accordance with the recommendations of ACI 309.

B. Vibrator Size: Provide a sufficient intensity and duration of vibration to cause concrete to combine with previously placed concrete, to fill corners, to compact thoroughly and to embed reinforcement, pipes, conduits, and similar work

completely. Insert vibrators into and withdraw from the concrete vertically at close intervals. Do not use vibrators to move concrete laterally.

C. Spare Units: Have on hand a sufficient number of vibrators to assure that the incoming concrete can be properly compacted within 15 minutes after placing. Provide reserve vibrators for use when others are being serviced. Do not start the placement of any concrete unless more than one vibrator is available.

3.3 CONCRETE TESTS

A. Compression Testing: Test concrete test cylinders in compression at the laboratory designated.

B. Samples: Take samples for strength tests of laboratory cured cylinders for tests of each class of concrete placed each day consisting of four cylinders from the same batch of concrete. Test two cylinders at 7 days and two at 28 days. Determine concrete strength by the average of the two cylinder strengths determined at either age. Take samples not less than once a day nor less than once for each 150 cubic yards of concrete, or 5,000 square feet of area.

C. Field Curing: Take samples for field cured cylinders to determine concrete compressive strength for form removal time as required.

D. Laboratory Curing: Sample fresh concrete in accordance with ASTM C 172. Mold and laboratory cure cylinders for strength tests in accordance with ASTM C 31.

E. Slump Tests: Perform slump tests in accordance with ASTM C 143, at the same time cylinders are made. Make tests to determine air content of fresh concrete twice daily, at least 4 hours apart, in accordance with either ASTM 173 or with an approved testing device. Concrete with excessive slump or improper air content will be rejected. Deliver no additional concrete until the cause of the deficiency is determined and corrected.

F. Test Requirements: Test cylinders in accordance with ASTM C 39 for both the 7-day and the 28-day compressive strength.

G. Successful Testing Requirements: Consider the strength level of the concrete mix for each individual class of concrete satisfactory when:

1. The average of all sets of three consecutive 28-day strength tests (average of two cylinders) equal or exceed the specified compressive strength (f'_c).

2. No individual 28-day strength test (average of two cylinders) falls below f'_c by more than 500 psi.

3. If either of these requirements are not met, make changes in the mix proportions immediately to achieve the required strength.

H. Shrinkage Tests: Perform drying shrinkage test on each 1000 cubic yards placed. Test in accordance with ASTM C157, modified as follows:

1. Make three (3) 4-inch x 4-inch x 11-inch specimens for each test.

2. Remove specimens from molds at an age of 23 hours ∀ 1 hour. Immediately submerge in water at 73 degrees F ∀ 3 degrees F for at least 30 minutes and measure within 30 minutes thereafter to determine original length. Then immediately submerge in lime-saturated water in accordance with ASTM C 157. After 7 days, remove specimens from lime-saturated water and measure. Use this measurement as the base length to determine shrinkage deformation. After measuring, immediately store in a humidity-controlled room maintained at 73 degrees F ∀ 3 degrees F and 50% ∀ 4% relative humidity for the remainder of the test measurements. To determine shrinkage take measurements, expressed as percentage of base length, and report separately for 7, 14 and 21 days ∀ 4 hours.

3. Results of the drying shrinkage on test shall be reported to the nearest 0.001 percent. If drying shrinkage of any specimen deviates from the average for that test age by more than 0.004 percent, the results of that specimen shall be disregarded.

3.4 LOW CONCRETE STRENGTH TEST RESULTS

A. Test Cores: If it is determined that the serviceability of the concrete is significantly reduced by low concrete strength test results, take test cores from the area in question. Drill and test cores in accordance with ASTM C 42 except as noted. Take three cores for each strength test more than 500 psi below the specified f'_c.

B. Acceptable Levels of Strength: Concrete in the area represented by core tests will be accepted if the average of three cores is equal to or greater than 0.85 f'_c and no single core is less than 0.75 f'_c.

C. Unacceptable Concrete: Remove and replace concrete which does not meet the core test requirements or strengthen the concrete to the satisfaction of the RESIDENT PROJECT REPRESENTATIVE.

3.5 CURING

A. General: Generally follow the recommendations of ACI 308 for curing concrete.

B. Protection: Protect concrete surfaces normally exposed to the atmosphere against too rapid drying by curing for a minimum period of 7 days. For hot weather concreting and cold weather concreting follow the recommendations of ACI 305R and ACI 306R for curing concrete. Commence the curing period immediately following the placing of the concrete. Accomplish curing by one of the following methods. Should there be any delay in the application of the method of curing used, cover the concrete with moistened burlap held in complete contact with the surface

or kept wet by continuous sprinkling. Use curing water having a temperature that is within 20 degrees F of the concrete's surface temperature.

1. Accomplish water curing by the use of curing blankets wetted and applied to the concrete surface as soon as the forms have been removed, or in the case of slabs, as soon as the concrete has set up sufficiently to prevent marring of the surface. Maintain the covering material in a thoroughly saturated condition and maintain the presence of free water between the mat and the surface of the concrete at all times throughout the curing period.

2. Accomplish sheet material curing by use of waterproof paper or polyethylene film applied to the concrete surface as soon as it has set sufficiently hard to prevent marring. First, thoroughly wet the concrete surface, and then place the sheet materials in direct contact and anchor thereto in a manner to assure continuous contact throughout the curing period. Lap the sheet materials a minimum of 3 inches with the seams taped, cemented, or glued. Discoloration is objectionable on floors which have been steel troweled to a hard finish. Do not use polyethelene film on these floors.

3. Accomplish curing by using clear residual acrylic curing and sealing compound membranes on all interior concrete floor surfaces that do not receive a finish, overlays or hardener, and on stairs, landings and walking surfaces. Accomplish membrane curing immediately after removal of forms or in the case of unformed surfaces, immediately after final finishing. Uniformly coat the entire exposed surface with a clear curing compound membrane by means of an approved pressure spray distributor at the rate of 300 square feet per gallon of material. Apply the material so that the concrete surface is completely coated and sealed with one application. Do not apply the membrane to faces of construction joints or other surfaces against which additional concrete will be placed. Keep such surfaces continuously wet by other means.

4. Accomplish curing by using dissipating resin type curing compounds. Apply to all concrete surfaces except those listed in paragraph 3.5.B.3. Start curing immediately after removal of forms as in the case of unformed surfaces, immediately after final finishing while the concrete surface is still moist. Coat the entire exposed surface by means of approved pressure spray distributor at the rate of 200 square feet per gallon of material. Apply the material so that the concrete surface is uniformly coated with one application. Do not apply to the faces of construction joints or other surfaces against which additional concrete will be placed. Keep such surfaces wet by other means.

3.6 JOINTS AND BONDING

A. Joints: Make construction joints where shown or permitted. Locate such joints to ensure stability, strength, and water tightness, and provide a water stop where shown. Build all corners monolithically, and continuously concrete on either side to points shown.

B. Timing Between Placement: Provide at least 2 hours of elapsed time after placing concrete in the columns or walls before depositing concrete in beams, girders, or slabs supported thereon. Consider beams, girders, brackets, column capitals, and haunches as part of the floor system and place them integrally with the floor.

C. Horizontal Keyways: Build horizontal keyways to permit flushing water to escape from the keyways.

D. Keyway Description: Provide continuous, straight, and regular keys or grooves in joints. Bring exposed concrete surfaces to a true level line at the top of every horizontal construction joint. Provide the exposed construction joints with a row of form ties located in the concrete at from 4 to 6 inches from the joint to tighten the forms for subsequent sections. Set reinforcement to extend into subsequent sections of construction, as shown. If required, provide water stops having watertight splices and corner intersections and meet the requirements as specified. Remove all bulkheads or other joint forming material before placing adjacent concrete.

E. Continuous Placement Procedure: Carry on continuous placing of concrete between the construction joints shown. If for any reason it becomes necessary to stop the placing of concrete at locations other than those indicated, such locations and the manner of making the joint are subject to approval.

F. Grout Use Between Surfaces: Thoroughly clean and wet concrete surfaces against which the new concrete is to be placed. Just prior to placing new concrete, slush horizontal surfaces and joints with at least 2 inches of cement grout of the same mixture as the concrete but with coarse aggregate omitted. Use special care in placing and puddling concrete at vertical joints to ensure a bond with existing concrete. Do not make vertical construction joints in watertight construction, unless shown or approved in writing.

G. Contraction (Control) Joints in Slabs-on-Ground (for walkways and pavements outside the structure or building): Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8" x 1/4 slab depth or inserts 1/4" wide x 1/4 of slab depth, unless otherwise indicated.

1. Form contraction joints by inserting premolded plastic, hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

    a. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.

2. If no joint pattern is shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third-bays).

3.7 CONCRETE FLOOR SURFACES

A. Floor Surfaces: Construct the concrete floor surfaces monolithicly with the structural slab being finished as indicated in the following schedule, unless otherwise shown or as specified:

1. Tank bottoms and other surfaces not to be used as walkway areas - screeded, wood floated, steel troweled.

2. Tank bottoms to receive grout topping swept in by mechanisms - screeded, wood floated.

3. Exterior walkways and platforms over tanks to be used as walking areas - screeded, wood floated, steel troweled, light broomed.

4. Exterior sidewalks - screeded, wood floated, divided into panels, steel troweled, light broomed.

5. Interior working spaces such as screen rooms, motor rooms and pump rooms - screeded, wood floated, steel troweled, chemically hardened.

6. Interior surface in areas to receive tile or carpeting such as offices, control rooms, toilet rooms and the like - screeded, wood floated, steel troweled, broomed.

7. Interior surface in areas to receive mortar setting beds for tile and other bonded applied cementitious finish flooring material- screeded roughen surface before final set, with stiff brushes, brooms or rakes.

8. Reservoir bottoms - screeded, wood floated.

B. Panel Construction: Construct panels, where required, approximately 10 feet square using an edger to form dummy joints 1/4-inch deep.

C. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, as otherwise indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if the area is small or inaccessible to power units. For nonsloping level surfaces check and level the surface plane to tolerances of F_F 18 and as determined by ASTM E 1155. For sloping surfaces check the surface planes to a tolerance of F_F 18 as determined by ASTM E 1155. Cut

down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture. Check the floors flatness (F_F) and levelness (F_L) on an area of 400 square feet for level floors and 400 square feet of sloping floors or tanks to be selected by the RESIDENT PROJECT REPRESENTATIVE.

D. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

1. After floating, begin first trowel finish operation using a power-driven trowel. For nonsloping level surfaces check and level the surface plane to tolerances as determined by ASTM E 1155. Cut down high spots and fill low spots. For sloping surfaces check the surface planes to a tolerance of $F_F = 20$ as determined by ASTM E 1155. Check the floor flatness (F_F) and levelness (F_L) on an area of 400 square feet for level floors 400 square feet for sloping floor or tanks to be selected by the RESIDENT PROJECT REPRESENTATIVE. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances specified. Grind smooth surface defects which would telegraph through applied floor covering system.

E. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

F. Nonslip Broom Finish: Apply nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere, where indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with the RESIDENT PROJECT REPRESENTATIVE before application.

G. Chemical-Hardener Finish: Apply chemical-hardener finish to interior concrete floor slabs that do not receive a floor covering. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Dilute liquid hardener with water (parts of hardener/water as follows), and apply in 3 coats; first coat, 1/3-strength; second coat, 1/2-strength; third coat, 2/3-strength. Evenly apply each coat, and allow 24 hours for drying between coats.

1. Apply proprietary chemical hardeners, in accordance with the manufacturer's printed instructions.

2. After the final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

H. Nonslip Aggregate Finish: Apply the nonslip aggregate finish to concrete stair treads, platforms, ramps, sloped walks, and elsewhere where indicated.

1. After completion of float finishing, and before starting trowel finish, uniformly spread 25 pounds of dampened nonslip aggregate per 100 square feet of surface. Tamp aggregate flush with surface using a steel trowel, but do not force it below the surface. After broadcasting and tamping, apply trowel finishing as specified.

2. After curing, lightly work the surface with a steel wire brush, or an abrasive stone and water to expose nonslip aggregate.

I. Protection: Cover all finished floors, walkways, and slabs with boards, canvas, heavy paper or similar covering to protect them from damage.

3.8 CONCRETE SURFACES

A. Beveling Edges: Finish top edges of walls and equipment pads with a 1/2-inch beveled edge, unless other details are shown, and rub off any burrs remaining upon removal of the forms.

B. Form Removal Inspection: Immediately after stripping the forms, inspect all concrete surfaces. Remove all fins, offsets, burrs, ridges, or other unsightly marks from the exposed concrete.

C. Patching: Patch placement joints, voids, stone pockets, or other defective areas before the concrete is thoroughly dry. Chip away defective areas to a depth of not less than 1 inch with all edges perpendicular to the surface. Wet the area to be patched, including at least 5 inches of the adjoining surface, prior to placing the patching mortar. Then scrub onto the surface a grout of equal parts of cement and sand mixed to a brushing consistency followed immediately by the patching mortar. Make the patch of the same material and of approximately the same proportions as used for the concrete, except omit the coarse aggregate. For exposed concrete, substitute white cement for part of the gray cement so that the patch will match the color of the surrounding concrete. Determine the proportion of white and gray cement by making a trial patch. Use as little water as consistent with requirements of handling and placing. Mortar: Do not retemper mortar. Thoroughly compact and screed off the mortar so as to leave the patch slightly higher than the surrounding surface. Then leave it undisturbed for a period of 1 to 2 hours to permit initial shrinkage before being finally finished. Finish the patch to match the adjoining surface and cure as specified for the original concrete.

D. Tie Hole Patching: Patch tie holes before the concrete is thoroughly dry. Plug tie holes flush with the surface using portland cement mortar. Prewet tie holes with clean water and apply a neat cement slurry bond coat. Densely tamp mortar of a dry-tamp consistency into the tie holes exercising care so as not to smear mortar onto the finished concrete surface. Included sufficient white cement in the mortar

mix to cause the plugged holes to blend in with the adjacent surfaces. Make sample patches with different mixes to assure that this requirement is met.

3.9 ARCHITECTURAL CONCRETE SURFACES

A. General: Architectural concrete is defined herein under Subsection 1.1B.

B. Requirements: Provide architectural concrete having a pleasing appearance with minimal color and texture variations and minimal surface defects when viewed from a distance of twenty feet. The standard for acceptance of architectural concrete will be the mock-up sample panel specified herein under Subsection 1.4D.

C. Smooth Finish (with rustications): Provide smooth finished architectural concrete by use of High Density Overlay Plyform forms as specified in Section 03 10 00. Provide rustications at form joints and where shown by use of rustication strips as specified in Section 03 10 00.

D. Textured Finish: Provide textured finish architectural concrete by use of form liners as specified in Section 03 10 00.

E. Exposed Tie Holes: Provide concrete with exposed form tie holes in smooth concrete bonds by use of the bolts as specified in Section 03 10 00.

F. Sack Finish: Finish smooth exposed in view surfaces (other than architectural concrete) including vertical surfaces and undersides of slabs, stairs and platforms with a rubbed sack finish.

1. Saturate surfaces thoroughly with water and keep wet during the entire operation. Apply uniformly by a brush, plasterer's trowel, or rubber float a grout of 1 part portland cement and 1-1/2 to 2 parts fine sand.

2. Floating: Immediately after applying the grout, vigorously float the surface with a wood, sponge rubber, or cork float to fill any small air holes. Scrape off excess grout with a sponge rubber float. If the float pulls grout from the holes, use a sawing motion.

3. Procedure for Grout Placement: Allow the grout remaining on the surface to stand undisturbed until it looses some of its plasticity but not its damp appearance. Then rub the surface with clean, dry burlap to remove all excess grout. Provide sufficient materials and workmanship such that all air holes remain filled with no visible film of grout remaining after the rubbing. Complete any section being finished with grout the same day.

4. Placement Timing: If possible, do the work during cool damp weather. During hot and dry weather, keep the concrete moist with a fine fog spray during the sack finishing. Moist cure the completed surface by keeping the area wet the entire day following the operation. Do not begin the rubbed sack finishing until all defects have been repaired.

3.10 CONCRETE STAIR TREADS AND LANDINGS

A. Tread and Landing Application: Construct treads and landings of all exterior and interior concrete stairs by applying a nonslip surface which is applied as an integral cement finish before the initial set of the slab has taken place, unless abrasive nosings or other finish is indicated. Compound and apply the finish consisting of 1/2-inch layer of stiff, thoroughly mixed mortar comprising 1 part cement and 2 parts sand to which is added carborundum grit in the amount of 1/4 to 1/2 pound per square foot of finished surface. Screed and trowel the mortar to a smooth and even surface.

3.11 EPOXY ADHESIVE

A. Epoxy Adhesives for Bonding: Use epoxy adhesive for bonding fresh concrete to existing concrete where shown and grouting dowels into vertical holes.

B. Recommendations: Mix and apply epoxy adhesive in accordance with the manufacturer's recommendations and in accordance with the requirements of the "Standard Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive - ACI 503R.

C. Surface Preparation: Roughen existing concrete, by sandblasting. Provide all surfaces free of standing water and clean as required.

3.12 EPOXY GEL

A. Epoxy Gels for Dowels: Use epoxy gel for grouting dowels into horizontal holes.

B. Application: Apply epoxy gels in accordance with the manufacturer's recommendations.

3.13 POLYMER MODIFIED NONSAG MORTAR

A. General: Mix and apply material in accordance with the manufacturer's recommendations.

B. Surface Preparation: Clean existing concrete that is to receive the material of all loose concrete, dirt, oil, grease and bond-inhibiting materials and mechanically roughen to obtain an aggregate-fractured surface with a minimum profile of 1/16-inch.

C. Mortar Placement: At the time of application, saturate existing concrete such that it is surface dry with no standing water. Scrub mortar into the substrate filling all pores and voids. Force the material against the edges of repairs, working it toward the center. After applying material, consolidate and then screed. Do not place the material in lifts greater than 1-inch. Where multiple lifts are required to achieve the required thickness, score the top surface of each lift to produce a roughened surface for the next lift. Allow the preceding lift to reach final set, 30 minutes minimum

before applying fresh material. Scrub fresh mortar into the preceding lift. Allow mortar to set to desired stiffness and then finish with wood or sponge float for a smooth surface.

D. Curing Requirements: Moist cure with a fine mist spray of water, wet burlap, or nonsolvent-based curing compound. If necessary, protect newly applied material from rain. To prevent freezing, cover with insulating material.

3.14 CORROSION-RESISTANT COATING

A. Blast Cleaning: Blast clean existing exposed reinforcing steel to white metal color and immediately coat reinforcement with two 10 mil thick coats of corrosion-resistant coating applied in accordance with the manufacturer's recommendations.

3.15 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after the work of other trades is in place. Mix, place, and cure concrete as specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Curbs: Provide a monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of the manufacturer furnishing machines and equipment.

D. Vapor Barrier Installation: Install vapor barrier in accordance with manufacturer's instruction and ASTM E 1643-98, and as specified below.

1. Following leveling and tamping of granular base, place vapor barrier, as shown and specified, and then place the slab on grade.

2. Following leveling of the substrate, place vapor barrier, and then a layer of granular fill, as shown and specified. Place slab on grade over the granular fill after it has been leveled and tamped.

3. Unroll vapor barrier with longest dimension parallel with the direction of the concrete pour.

4. If grade beams or footings are provided, continue vapor barrier around the perimeters of grade beams and footings adjacent to grade or granular fill, and seal to foundation walls.

5. Overlap joints 6 inches and seal with manufacturer's tape.

6. Seal all penetrations (including pipes) with manufacturer's pipe boot.

7. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities. Use seam tape or mastic to seal around reinforcing steel penetrations and permanent utilities.

8. Repair damaged areas by cutting patches of vapor barrier, covering the damaged area and providing 6 inches of overlap. Tape all four sides with tape.

END OF SECTION

SECTION 051200- STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes structural steel.

B. This Section includes structural steel and architecturally exposed structural steel.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section “Quality Control” for independent testing agency procedures and administrative requirements.
2. Division 05 Section “Steel Deck” for field installation of shear connectors.
3. Division 05 Section “Metal Fabrications” for loose steel bearing plates and miscellaneous steel framing.
4. Division 09 Section “Painting” for surface preparation and priming requirements.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.

B. Engineering Responsibility: Engage a fabricator who utilizes a qualified Illinois registered structural engineer to prepare calculations, shop drawings, and other structural data for structural steel connections.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data for each type of product specified.

C. Shop Drawings detailing fabrication of structural steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and snow size, length, and type of each weld.
3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing conditions.

4. Include Shop Drawings signed and sealed by a qualified structural engineer responsible for their preparation. If electronic files are submitted for review, they must be full scale, properly oriented and bound. Prior to submittal, fabricator is to contact architect and engineer to determine how many full size hard copies are to be provided to each reviewer. Cost of hard copy prints are to be borne by the preparer.

D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.

1. Structural steel, including chemical and physical properties.
2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Shear stud connectors.
5. Shop primers
6. No shrink grout.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.

1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:
   a. Category: Category I, conventional steel structures.
   b. Fabricator shall be registered with and approved by authorities having jurisdiction.

C. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Specification for Structural Steel Buildings-Allowable Stress Design and Plastic Design."
2. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
3. ASTM A 6 (ASTM A 6M) "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
4. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Structural Engineer Qualifications: A structural engineer who is legally authorized to practice in the 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 projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.

E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel".

1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.
2. Obtain Architect's approval of mockups before start of final unit of Work.

F. FHP Quality Control Initial Phase Meeting (Preinstallation Conference): Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.07 SEQUENCING

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Steel Shapes, Plates, and Bars: As Follows:

1. Carbon Steel: ASTM A 992 (50 ksi)

B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.

C. Hot-Formed Structural Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Type E or S, Grade B.

E. Weight Class: Standard, unless noted otherwise.

F. Finish: Black, except where indicated to be galvanized.

G. Anchor Rods, Bolts, Nuts, and Washers: As follows:

H. Un-headed Rods: ASTM A 36 (ASTM A 36M).

I. Unheaded Bolts: ASTM A 687, high strength.

J. Headed Bolts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.

K. Washers: ASTM A 36 (ASTM A 36M).

L. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

M. Finish: Plain, uncoated, unless noted otherwise.

N. Finish: Hot-dip zinc coating, ASTM A 153, Class C, for exterior work.

O. Direct-Tension Indicators: ASTM F 359, Type 325.

P. Welding Electrodes: Comply with AWS requirements.

2.02 PRIMER

A. Primer: Fast-curing, lead-and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS TT-P-664.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

2.03 GROUT

A. Cement Grout: Portland cement, ASTM C 150, Type 1; and clean, natural sand, ASTM C 404, Size No. 2. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, no corrosive, non-staining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

2.04 FABRICATION

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

1. Camber structural steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6 (ASTM A 6M) and maintain markings until steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

B. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.

1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.

2. Comply with fabrication requirements, including tolerance limits, of AISC's " Code of Standard Practice for steel buildings and bridges" for architecturally exposed structural steel.

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded.

D. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.

E. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.05 SHOP CONNECTIONS

A. Shop install and tighten non-high strength bolts, except where high-strength bolts are indicated.

B. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Bolts: ASTM A 325 (ASTM A 325M) high-strength bolts, unless otherwise indicated.
2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

C. Welded Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of backside welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch (13 mm) and larger. Grind flush butt welds. Dress exposed welds.

2.06 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed-on fireproofing.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:

1. SSPC-SP 3 “Power Tool Cleaning.”

C. Priming: Immediately after surface preparation, apply primer according to manufacturer’s instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Strip paint corners, crevices, bolts, welds, and sharp edges.
2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

2.07 GALVANIZING

A. Hot-dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123.

2.08 SOURCE QUALITY CONTROL

A. Contractor will engage an independent testing and inspecting agency agreeable to owner and, architect and engineer to perform inspections and tests and to prepare test reports. All testing fees to be shown as separate alternate Items on bids

1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
2. Provide testing agency with access to places where structural steel Work is being fabricated or produced so required inspection and testing can be accomplished.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicated do not comply with specified requirements.

C. Additional testing, at Contractor’s expense, will be performed to determine compliance.

D. Shop bolted connections will be tested and inspected according to RCSC’s “Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.”

1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table Number 2.

E. In addition to visual inspection, shop-welded connections will be inspected tested according to AWS D1.1 and the inspection procedures listed below, at testing agency’s option.

1. Liquid Penetrate Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level “2-2T.”
4. Ultrasonic Inspection: ASTM E 164.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.

B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless other wise indicated.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow curing.

    a. Comply with manufacturer's instructions of proprietary grout materials.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

1. Maintain erection tolerances of architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection.

H. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

A. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Bolts: ASTM A 325 (ASTM A 325M) high-strength bolts, unless otherwise indicated.
2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

B. Weld connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of backside welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch (13mm and larger. Grind flush butt welds. Dress exposed welds.

3.05 FIELD QUALITY CONTROL

A. Contractor will engage an independent testing and inspecting agency agreeable to the owner and engineer to perform filed inspections and tests and to prepare test reports. All testing fees to be shown as separate alternate Items on bids

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.

E. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.

1. Liquid Penetrate Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones incomplete fusion or penetration will not be accepted.
3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level “2-2T.”
4. Ultrasonic Inspection: ASTM E 164.

3.06 CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

   1. Apply by brush or spray to provide a minimum dry film thickness of 1.5mils (0.038mm).

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on structural steel are included in Division 9 Section “Painting.”

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.

END OF SECTION

SECTION 052100 -STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes LH, K and SP steel joists and accessories as shown and specified.

1.2 SUBMITTALS

A. Product Data: Submit copies of manufacturer's specifications and installation instructions for each type of joists and accessories.

B. Shop Drawings: Submit detailed drawings showing layout of joist units, special connections, jointing and accessories. Include the mark, number, type, location and spacing of joists and bridging. Note certification of SJI compliance on Shop Drawings.

1. Submit detailed fabrication and erection drawings for joists, anchorages and bridging.
2. Coordinate with shop drawings for supporting structure.

1.3 QUALITY ASSURANCE

A. Standards: Provide joists fabricated in compliance with the following, and as herein specified:

1. SJI "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders" for joist series shown on Drawings.

B. Qualification of Welding Work:

1. Qualify welding processes and welding operators in accordance with the AWS "Qualification requirements".

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle steel joists as recommended in SJI Specifications. Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 - PRODUCTS

2.10 MATERIALS

A. Steel: Comply with AISC and SCI Specifications.

B. Steel Bearing Plates: ASTM A 36.

C. High-Strength Threaded Fasteners: ASTM A 325 or A 490 heavy hexagon structural bolts with nuts and hardened washers.

D. Steel Prime Paint: Comply with SJI Specifications, except asphalt type paint not permitted.

E. Non-Metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with ASTM C1107. Grout shall have a minimum compressive strength of 5000 psi at 28 days when tested in conformance with ASTM C 109.

2.11 FABRICATION

A. General: Fabricate steel joists in accordance with SJI Specifications.

1. Top and Bottom- Chords: Double angle member only.
2. Top Chord Arrangement: Parallel to bottom chord unless indicated.

B. Camber: Camber joists according to SJI's Specifications, unless indicated.

C. Holes in Chord Members: Provide holes in chord members only where shown on Shop Drawings for securing other Work to the steel joists; however, deduct the area of holes from the area of the chord when calculating the strength of the member.

D. Extended Ends and Top Chord Extensions: Provide extended ends and top chord extensions complying with the manufacturer's standards and requirements of applicable SJI Specifications load tables.

1. Unless otherwise indicated, provide "R" type extended ends.

E. Ceiling Extension: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards, of sufficient strength to support the ceiling construction. Extend ends to within 1/2" of the joist support, unless otherwise indicated.

F. Bridging:

1. Provide horizontal or diagonal type bridging complying with SJI Specifications.
2. Provide bridging anchors for ends of all bridging lines terminating at walls or beams.
3. Provide a row of bracing at first panel point at all exterior walls and elsewhere where shown to resist wind uplift.
4. Unless indicated, neither bridging nor bridging anchorage shall extend below the elevation of the joist bottom chords.

G. End Anchorage: Provide end anchorages including steel bearing plates to secure joists to adjacent construction, complying with SJI Specifications.

1. Where joist slope exceeds 1/4" per foot, provide sloped seats matching joist slope.

H. Header Units: Provide header units to support tail joists at openings in floor or roof system not framed with steel shapes.

I. Shop Painting:

1. Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint.
2. Apply shop coat of steel joist primer paint to steel joists and accessories, by spray, dipping, or other method to provide a continuous dry paint film thickness of not less than 1.00 mil.

PART 3 - EXECUTION

3.10 INSPECTION

A. Erector must examine the areas and conditions under which steel joists are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the Work. Start of Work will evidence acceptance.

3.11 ERECTION

A. General: Place and secure steel joists in accordance with SJI Specifications," final Shop Drawings, and as herein specified.

B. Anchors:

1. Furnish anchor bolts and other devices to be built into the concrete and masonry construction. Furnish templates for the accurate location of anchors in other Work.
2. Furnish unfinished, threaded fasteners for anchor bolts, unless otherwise indicated.

C. Placing Joists:

1. Do not start placement of steel joists until supporting Work is in place and secured. Place joists on supporting Work, adjust and align in accurate locations and spacing before permanently fastening.
2. Provide for temporary stability of joists as required by SJI Specifications and other applicable standards.
3. Where joist camber does not match line of adjacent structural supports, the contractor shall make necessary adjustments with the prior approval of the Architect.

D. Bridging: Install bridging simultaneously with joist erection, before any construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams. Unless indicated, do not allow bridging or bridging anchors to extend below the bottom chord of joists.

E. Fastening Joists:

1. Field weld joists to supporting steel framework in accordance with SJI Specifications for the type of joists used. Coordinate welding sequence and procedure with the placing of joists.
2. Secure joists resting on masonry or concrete bearing surfaces by bedding in mortar and anchoring to masonry or concrete construction as specified in SJI Specifications for the type of steel joist used.

3.12 SUPPORT OF OTHER WORK

A. Work of other trades imparting a horizontal load shall not be supported from the bottom chord of a joist without additional bracing, except as approved by the joist manufacturer.

B. Vertical concentrated loads shall be supported at panel points unless additional web framing is provided or as allowed by the joist manufacturer.

3.13 FIELD QUALITY CONTROL

A. Joists welded in place are subject initially to inspection and testing by the Owner. Expense of removing and replacing any portion of the steel joists for testing purposes will be borne by the Owner if welds are found to be satisfactory. Pay for additional testing required and remove and replace any Work found to be defective and provide new acceptable Work.

END OF SECTION

SECTION 05 31 23 STEEL ROOF DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes all steel roof deck.

1.2 SUBMITTALS

A. Product Data: Submit copies of manufacturer's specifications and installation instructions. Include manufacturer's information as may be required to show compliance with these Specifications.

B. Shop Drawings: Submit detailed drawings showing layout of deck panels, anchorage details and every condition requiring closure panels, supplementary framing, special jointing or other accessories.

C. Calculations: Submit engineering calculations and manufacturer’s data verifying that the specified deck meets the design requirements.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following codes and standards, except as otherwise shown or specified to be more stringent:

1. AISI "Specification for the Design of Cold-Formed Steel Structural Members."
2. AWS D1.3 "Structural Welding Code-Sheet Steel."
3. SDI "Design Manual for Composite Decks, Form Decks and Roof Decks.”
4. FM "Loss Prevention Data 1-28."

B. Qualification of Welding Work:

1. Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure."
2. Decking welded in place is subject to inspection and testing. Remove Work found to be defective and provide new acceptable Work.

C. FM Listing: Provide metal roof deck units, which have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for "Class I" fire rated construction and “Class I-90” windstorm rating.

D. Performance Requirements:

1. Compute the properties of metal roof deck sections on the basis of the effective design width as limited by the provisions of the AISI Specifications for deck depth and gage shown on the drawings.
2. Design and fabricate deck for a maximum deflection of L/240 of the clear span under the total uniform dead and live loads indicated.
3. Install and anchor roof deck units to resist gross uplift loading of 30 pounds per square foot.

a. At overhangs, anchor to resist 45 pounds per square foot.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site at such intervals to ensure uninterrupted progress of the Work.

B. Deliver items to be incorporated in the Work of other trades in ample time to not delay that Work.

C. Keep deck panels and accessories off the ground. Protect deck panels and accessories from corrosion and deterioration.

D. Do not store materials on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel for Galvanized Finish: ASTM A 653, Structural Quality.

B. Galvanizing: ASTM A 924, G 60 (G 90 in corrosive environments).

C. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces.

D. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33, minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.

1. Color: Manufacturer's standard Gray White,

E. Deck Profile: Type B.

F. Profile Depth: As indicated, 1-1/2 inches.

G. Design Uncoated-Steel Thickness: 20 Gage

H. Span Condition: Triple span or more.

I. Side Laps: Overlapped or interlocking seam at Contractor's option.

J. Flexible Closure Strips for Deck: Vulcanized, closed-cell, and synthetic rubber.

2.2 FABRICATION

A. General: Form deck units in lengths to span 3 or more supports with nested 2" end laps and nesting side laps. Provide deck configurations complying with SDI "Specifications and Commentary for Steel Roof Deck" of depth and flute width indicated on Drawings and as specified herein.

1. Provide galvanized steel deck, treated to receive paint where painting is scheduled.

B. Roof Sump Pans: Fabricate from a single piece of not less than 14 gage galvanized sheet steel with level bottoms and sloping sides. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide.

C. Metal Closure Strips: Fabricate of not less than 20 gage galvanized sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends and sides of decking.

D. Mechanical Side Lap Fasteners: Manufacturer's standard, corrosion-resistant, hexagonal washer head, self-tapping, carbon steel screws, No. 10 minimum diameter, Factory Mutual approved as a method for securing steel roof deck for Class indicated above.

E. Provide ridge and valley plates, closure plates, filler plates, sump pans, etc., necessary to perform the Work, whether shown on drawings or not.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install roof deck units and accessories in accordance with SDI and manufacturer's recommendations and final Shop Drawings, and as specified herein. Brush-off contaminates, dirt and debris.

B. Placing Deck Units:

1. Place deck units on supporting steel framework and adjust to final position with ends bearing on supporting members and accurately aligned end to end before being permanently fastened. Lap ends not less than 2".
2. Do not stretch or contract the sidelap interlocks. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
3. Work with structural steel erector in locating decking bundles to prevent overloading of structural members.
4. Do not overload deck.

C. Fastening Deck Units: Unless noted otherwise, comply with the following:

1. Permanently fasten roof deck units to steel supporting members by not less than 5/8" diameter fusion welds, or elongated welds of equal strength, not less than 12" on center at supports.

    a. Use welding washers for 22 gage and thinner deck.

2. Comply with AWS requirements and procedures for manual shielded metal-arc welding, the appearance and quality of welds, and the methods used in correcting welding work.
3. Lock side laps between adjacent deck units at maximum 3' on center by screw mechanical fasteners, minimum 2 per span.
4. Do not button punch or clinch sidelaps.

D. Cutting and Fitting: Cut and fit roof deck units and accessories around other Work projecting through or adjacent to the roof decking. Provide neat, square and trim cuts.

E. Reinforcement at Openings:

1. Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other Work.
2. Reinforce roof decking around openings greater than 6" to less than 12" in any dimension by means of a flat steel sheet placed over the opening and fusion welded to the top surface of the deck. Provide steel sheet of the same quality as the deck units, not less than 20 gage, and at least 12" wider and longer than the opening. Provide welds at each corner and spaced not more than 12" on center along each side. Openings greater than 12" across the ribs shall be suitably reinforced with angles. See Structural Drawings.

F. Roof Sump Pans: Place roof sump pans over openings provided in the roof decking and weld to the top-decking surface. Space welds not more than 12" on center with at least one weld at each corner. Cut opening in the bottom of the roof sump to accommodate the drain size indicated.

G. Closure Strips: Provide flexible closure strips at all open uncovered ends and edges of roof decking, and in the voids between decking and other construction.

H. Roof Insulation Support: Provide metal closure strips for the support of roof insulation where the rib openings in the top surface of roof decking occur adjacent to edges and openings. Weld closure strips into position.

3.2 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction:

1. The Owner's testing service will inspect deck, deck fastening, and sidelap fastening.
2. Correct deficiencies in the work that inspections and laboratory test reports have indicated to not be in compliance with requirements. The Owner may have additional tests performed, at Contractor's expense, as may be necessary to reconfirm any non-compliance of the original Work, and as may be necessary to show compliance of corrected Work.

B. Contractor’s Responsibilities

1. Notify Agency sufficiently in advance of operations to allow for his assignment of personnel and scheduling of tests.
2. Coordinate with Agencies’ personnel, provide access to Work.
3. Furnish casual labor and facilities to provide access to Work to be tested to facilitate inspections and tests.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes metal work shown on architectural drawings not specified as part of products specified in other sections.

1.2 SUBMITTALS

A. Product Data: Submit copies of manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for stock products.

B. Shop Drawings:

1. Submit Shop Drawings for the fabrications and erection of all assemblies of metalwork, which are not completely shown by the manufacturer's data sheets. Include drawings, elevations, and details of sections and connections. Show anchorage and accessory items.
2. Include setting drawings and templates for location and installation of metal items and anchorage devices.
3. Where structural performance is required under "Quality Assurance", provide drawings signed and sealed by a state of Illinois licensed structural engineer with a statement of compliance with “Quality Assurance” requirements of this specification.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following, except as otherwise shown and specified:

1. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings," including "Commentary of the AISC Specifications."
2. AISC "Specification for the Design of Cold-Formed Steel Structural Members."
3. AWS "Structural Welding Code" as applicable.

B. Qualification for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

C. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.

1. Top Rail of Guardrail Systems:

a. Concentrated load of 300 lbf applied at any point nonconcurrently, vertically downward, or horizontally.
b. Uniform load of 100 lbf per linear foot applied nonconcurrently, vertically downward or horizontally.
c. Concentrated and uniform loads above need not be assumed to act concurrently.

2. Handrails Not Serving as Top Rails:

    a. Concentrated load of 250 lbf applied at any point nonconcurrently, vertically downward or horizontally.
    b. Uniform load of 50 lbf per linear foot applied nonconcurrently, vertically downward or horizontally.
    c. Concentrated and uniform loads above need not be assumed to act concurrently.

3. Infill Area of Guardrail Systems:

    a. Horizontal concentrated load of 200 lbf applied to an area of one square foot at any point in the system including panels, intermediate rails balusters, or other elements composing the infill area.
    b. Above load need not be assumed to act concurrently with uniform horizontal loads on top rails of railing systems in determining stress on guard.

4. Treads of Steel Stairs:

    a. Uniform load of 100 lbf per square foot or a concentrated load of 300 lbf on an area of 4 square inches located in the center of the tread, whichever produces the greater stress without deflection.

5. Platforms of Steel Stairs:

    a. Uniform load of 100 lbf per square foot without deflection.

D. Safety Features: Engineer and fabricate stairs and railings to comply with requirements of 2012, International Building Code, including headroom, handrail and guardrail locations, projection, height, and baluster spacing.

E. Accessibility Requirements: Furnish and install metal fabrications to comply with the 2010 ADA Standards for Accessible Design, the Illinois Accessibility Code, including ICC/ANSI A117.1.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver items in a sequence as required to be incorporated into the Work without delaying the Project.

B. Keep members off the ground. Protect steel members and packaged materials from corrosion and deterioration.

C. Do not store materials on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials that are smooth and free of pitting, seam marks, roller marks, rolled trade names, roughness, or

other surface blemishes. Remove blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and application of surface finishes.

B. Steel Materials:

1. Steel Plates, Shapes and Bars: ASTM A 36.
2. Steel Plates to be Bent or Cold Formed: ASTM A 283, Grade C.
3. Steel Tubing: ASTM A 500, cold-formed steel tubing.
4. Rolled-Steel Floor Plate: ASTM A 786, rolled from plate complying with ASTM A 36 or ASTM A 283, Grade C or D.
5. Steel Pipe: ASTM A 53, Standard Weight (Schedule 40), black finish, unless otherwise indicated. Provide galvanized finish for exterior installations and where indicated.
6. Cast-Iron: Either gray iron, ASTM A 48, or malleable iron, ASTM A 47, unless otherwise indicated.

C. Aluminum Materials:

1. Alloy and Temper: Provide alloy and temper as specified or as otherwise recommended by the aluminum producer or finisher.
2. Sheet and Plate: Flat sheet complying with ASTM B 209, Alloy 6061-T6.
3. Extruded Shapes and Bar: ASTM B 221, Alloy 6063-T6.
4. Extruded Structural Pipe and Tubing: ASTM B 429, Alloy 6063-T6. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.
5. Plate and Sheet: ASTM B 209, Alloy 6061-T6.
6. Drawn Seamless Tube: ASTM B 210, Alloy 6063-T832.
7. Castings: ASTM B 26, Alloy 443.0-F.
8. Forgings: ASTM B 247, Alloy 6061-T6.

D. Brackets, Flanges and Anchors: Cast of the same type material and finish as supported rails tapped for concealed attachment, unless otherwise indicated.

E. Metal Bar Grating:

1. Comply with the NAAMM "Metal Bar Grating Manual," and as herein specified:

    a. Cross Bars: Perpendicular to bearing bars, secured by welding, forging, or mechanical locking.
    b. Traffic Surface: Serrated.
    c. Steel Finish: Hot-dip galvanized after fabrication.

F. Fasteners:

1. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

    a. Provide stainless-steel fasteners for fastening aluminum.
    b. Provide stainless-steel fasteners for fastening stainless steel.

2. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers. Provide locking type hex nuts where indicated.

3. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

    a. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

4. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
5. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.

G. Concrete Inserts: Threaded or wedge type as shown, galvanized ferrous castings, either malleable iron, ASTM A 47 or cast steel, ASTM A 27. Provide belts, washers and shims as required, hot-dipped galvanized, ASTM A 153.

H. Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.

I. Anchor Rods: ASTM F 1554, Grade 36, non-headed type, unless otherwise indicated.

J. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.

K. Steel Primer Paint:

1. Typical Locations: Chromate and lead free rust-inhibitive metal primer equal to Tnemec V10-99G.
2. Architecturally Exposed Steel – Natatoriums: Organic zinc-rich primer; Tnemec 90-97 Tneme-Zinc, or zinc-rich primer that is part of the paint system identified, and produced by the manufacturer indicated, for field painting in Division 09 Section "Painting."

2.2 FABRICATION

A. General:

1. Shop Assembly: Pre-assemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly. Disassemble units only to the extent necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
2. Use materials of the size and thicknesses shown or, if not shown, of the required size and thickness to produce adequate strength and durability in the finished product for the intended use. Work to the dimensions shown or accepted on Shop Drawings, using proven details of fabrication and support.
3. Form exposed Work true to line and level with accurate angles and surfaces and straight, sharp edges.
4. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
5. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the Work.
6. Weld corners and seams continuously along entire line of contact to comply with the following:

a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
b. Obtain fusion without undercut or overlap.
c. Remove welding flux immediately.
d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

7. Form exposed connections with hairline joints which are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type shown or, if not shown, use Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous. Make up threaded connections tight so that threads are entirely concealed.
8. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices and fasteners to secure metal fabrications rigidly in place and to support indicated loads.
9. Cut, reinforce, drill and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
10. Remove sharp or rough areas on exposed traffic surfaces.
11. Hot-dip galvanize all exterior ferrous metal fabrications embedded in concrete. Hot-dip galvanize all other items where specified or shown.

    a. Exterior ferrous metal fabrications are defined as those items which are indicated to be installed in areas exposed to conditions which are not controlled by the building heating and cooling systems.
    b. Interior ferrous metal fabrications are defined as those items which are indicated to be installed in areas exposed to conditions which are controlled by the building heating and cooling systems.

12. Provide weep holes or another means to drain entrapped water in hollow sections that are exposed to exterior or to moisture from condensation or other sources.
13. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

B. Railings:

1. Cope intersections of rails and posts, weld joints and grind smooth. Butt weld end-to-end joints of railings or use welding connectors.
2. Weld corners and seams continuously and in accordance with the recommendations of AWS. Grind exposed welds smooth and flush, to match and blend with adjoining surfaces.
3. Form exposed connections with flush, smooth, hairline joints, using concealed fasteners wherever possible. Use exposed fasteners of the type shown or, if not shown, use Phillips flat-head (countersunk) screws.
4. Provide for anchorage coordinated with the supporting structure. Fabricate and space anchoring devices as shown and as required to provide adequate support.
5. Provide brackets, flanges and anchors for railing posts and for handrail supports.
6. Where indicated, provide toe boards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated, or if not indicated, use 4 inches high x 1/8 inch steel plate welded to, and centered between, each railing post.
7. Galvanize after fabrication at exterior locations.

C. Rough Hardware:

1. Furnish bent or, otherwise, custom-fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes.
2. Manufacture or fabricate items of sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

D. Loose Steel Lintels:

1. Weld adjoining members together to form a single unit.
2. Provide not less than 8" bearing at each side of openings, unless otherwise indicated.
3. Galvanize where installed in exterior wall.

E. Stairs and Ship Ladders:

1. Comply with "Recommended Voluntary Minimum Standards for Fixed Stairs" in NAAMM "Metal Stair Manual" except where more stringent requirements are necessary.
2. Use welding for joining pieces together, unless otherwise shown or specified. Fabricate units so that bolts and other fastenings, if used, do not appear on finish surfaces. Make joints true and tight.
3. Provide metal framing, hangers, columns, struts, clips, brackets, bearing plates and other components as required for support.
4. Provide brackets and bearing surfaces as detailed and as required to anchor and contain the stairs on the supporting structure.
5. Where masonry walls support the steel stair work, provide temporary supporting struts, designed for the erection of steel stair components before installation of masonry.
6. Fabricate stringers of structural steel channels, or plates, or a combination thereof, as shown. Provide closures for exposed ends of stringers.
7. Construct platforms of structural steel channel headers and miscellaneous framing members. Bolt or weld headers to strings. Bolt or weld framing members to strings and headers.
8. Fabricate grating treads with plate nosing on one edge and with angle or plate carrier at each end for string connections. Secure treads to strings with bolts or by welding.
9. Fabricate grating platforms, with nosing matching that on grating treads, at all landings. Provide toeplates at open sided edges of floor grating. Secure to platform framing with welds.
10. Form metal pans of minimum 12 gauge structural steel sheets or as required to support load over the span. Directly weld to stringers located to be covered by concrete fill (or support with angles).
11. Secure subplatform metal pans to platform frames with welds (or support with angles).
12. Provide railings (and handrails at walls).
13. Join posts, rails and corners as follows:

    a. Mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Butt railing splices and reinforce by a tight-fitting interior sleeve not less than 6" long.
    b. Railings may be bent at corners instead of joining, provided the bends are uniformly formed in jigs, with cylindrical cross section of pipe maintained throughout entire bend.

14. Adjust railings prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length.
15. Space posts not more than 5 feet on centers unless otherwise shown. Plumb posts in each direction.

F. Miscellaneous Framing and Supports:

1. Fabricate miscellaneous units to the sizes, shapes and profiles shown or, if not shown, of the required dimensions to receive adjacent Work to be retained or supported by the framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of all welded construction using mitered corners, welded brackets and splice plates and a minimum of joints for field connection. Cut, drill and tap units to receive hardware and similar items to be anchored to the Work.
2. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

G. Miscellaneous Protection Trim:

1. Fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth, exposed edges. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other Work.
2. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

    a. Except as otherwise shown, space anchors 2'-0" o.c. and provide units the equivalent of 1-1/4" x 1/4" x 8" steel strips.
    b. Provide adjustable anchors in masonry at maximum 16" o.c.

3. Galvanized (at exterior locations) (and) (where shown).

H. Ladders:

1. Comply with the requirements of authorities having jurisdiction and ANSI A14.3.
2. Provide 1/2" x 2-1/2" continuous structural steel flat bar side rails with eased edges, spaced 18" apart unless shown otherwise.
3. Provide 3/4" solid structural steel bar rungs, spaced 12" o.c., having non-slip top surface.
4. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
5. Support each ladder at top and bottom and at intermediate points spaced not more than 5'-0" o.c. Use welded or bolted steel brackets, designed for adequate support and anchorage, and to hold the ladder clear of the wall surface with a minimum of 7" clearance from wall to centerline of rungs.

I. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required.

J. Metal Bar Gratings:

1. Provide bar gratings using bars of type, material, sizes, spacing and construction indicated, or if not indicated, to support design loadings indicated. Comply with applicable requirements of NAAMM "Metal Bar Grating Manual."
2. Provide removable grating sections with end-banding bars for each panel, 4 saddle clip anchors designed to fit over 2 bearing bars, and 4 stud bolts with washers and nuts, unless otherwise indicated.
3. Notch gratings for penetrations as indicated. Layout unit to allow grating removal without disturbing items penetrating grating.
4. Provide banding for openings in grating separated by more than 4 bearing bars, of same material and size as bearing bars, unless otherwise indicated.

5. Notching of bearing bars as supports to maintain elevations shall not be permitted.
6. Weld stud bolts to receive saddle clip anchors to supporting steel members.

K. Pipe Bollards (Guards): 8-inch diameter, galvanized, schedule 40 steel pipe.

2.3 STEEL AND IRON FINISHES

A. Shop Painting:

1. Shop paint ferrous metalwork except surfaces and edges to be field welded (and those indicated to be galvanized).
2. Remove scale, rust and other deleterious materials before the shop coat of paint is applied. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning." Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 "Hand Tool Cleaning," SSPC SP-3 "Power Tool Cleaning," or SSPC SP-7 "Brush-Off Blast Cleaning." Steel that is to receive organic zinc-rich primer shall be cleaned in accordance with SSPC-4 SP-6 “Commercial Blasting.”
3. Apply one shop coat of metal primer paint to fabricated metal items, except apply two (2) coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.
4. Immediately after surface preparation, brush or spray on metal primer paint, applied in accordance with the manufacturer's instructions and at a rate to provide a uniform, dry film thickness of 2.0 mils for each coat (except 3.0 mils dry for zinc-rich coating). Use painting methods which shall result in full coverage of joints, corners, edges and all exposed surfaces.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123 for galvanizing steel and iron products.
2. ASTM A 153 for galvanizing steel and iron hardware.
3. Fabricate joints exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

C. Corrosion Protection: Coat concealed surfaces in contact with concrete, masonry, wood, or dissimilar metals, in exterior work and work to be built into exterior and below grade walls and decks, with a heavy coat of bituminous paint. Do not extend coating onto exposed surfaces.

2.4 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 PREPARATION

A. Furnish setting drawings, diagrams, templates, instructions and directions for the installation of anchorages to be embedded in concrete or masonry construction, such as concrete inserts,

anchor bolts and miscellaneous items having integral anchors. Coordinate the delivery of such items to the Project Site.

3.2 INSTALLATION, GENERAL

A. Set accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

B. Brace temporarily or anchor temporarily in formwork where Work is to be built into (concrete) and (masonry) or similar construction.

C. Anchor securely as required for the intended use, using concealed anchors wherever possible.

D. Fit exposed connections accurately together to form tight, hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch up shop paint coat.

E. Perform cutting, drilling and fitting required for the installation of the metal items, except cutting and drilling is not allowed on shop finish painted items. Restore finish.

F. Comply with AWS Code for the procedures of manual-shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

3.3 INSTALLING RAILINGS:

A. Adjust railings prior to securing in place to ensure proper matching at abutting joints and correct alignment throughout their length. Plumb posts in each direction. Secure posts and rail ends to building construction as follows.

B. Core drill holes in concrete not less than 1" greater than the outside diameter of post. Clean holes of all loose material, insert posts, and fill the space between post and concrete with non-shrink, nonferrous grout.

C. Anchor rail ends into (concrete) (and) (masonry) with round flanges welded to rail ends and anchored into the wall construction with expansion shields and bolts.

D. Anchor posts and rail ends to steel by welding.

E. Secure handrails to walls with wall brackets and end fittings. Locate brackets as indicated or, if not indicated, at not more than 5'-0" o.c. Provide flush-type wall return fittings with the same projection as that specified for wall brackets. Secure wall brackets and wall return fittings to building construction with hanger bolts and expansion shields into solid partition construction.

1. For concrete and solid masonry anchorage, use bolt anchor expansion shields and lag bolts.
2. For hollow masonry and stud partition anchorage, use toggle bolts having square heads.

3.4 INSTALLING STAIRS OR SHIP LADDERS:

A. Erect true to line and level. Maintain in position as required.

B. Provide hangers, struts, appurtenances and fasteners required for secure installation.

C. Secure handrails to walls by means of wall brackets and wall return fitting at handrail ends as detailed. Locate brackets not more than 5'-0" o.c. Provide wall return fittings, flush-type, with the same projection as that specified for wall brackets. Secure wall brackets and wall return fittings to building construction with hanger bolts and expansion shields into solid partition construction as follows:

1. For concrete and solid masonry anchorage, use bolt anchor expansion shields and lag bolts.
2. For hollow masonry and stud partition anchorage, use toggle bolts having square heads.

3.5 INSTALLING LOOSE PLATES:

A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.

C. Pack non-shrink, non-ferrous grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 INSTALLING GRATINGS:

A. Weld non-removable units to supporting members or framework.

B. Secure removable units to supporting members or framework with galvanized machine screws, or manufacturer's standard saddle or clip units.

3.7 INSTALLING PIPE BOLLARDS:

A. Set pipe in 12-inch diameter by 42-inch deep (min.) concrete foundation. Slope top of foundation to drain.

B. Fill pipe with concrete. Crown top to drain.

C. Field paint safety yellow unless otherwise indicated.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Wood centers, furring, grounds, blocking, nailers, temporary protection of all kinds, and all accessories and appurtenances required for the Work.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 04 20 00 - Masonry

2. Section 07 61 13 - Standing Seam Roofing

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials

2. FS TT-W-571 - Wood Preservation Treating Practices

3. AWPA - American Wood Preservers Association - Type A, Interior Fire Retardant Treated Lumber and Plywood

4. NFPA - National Forest Products Association, National Design Specification for Wood Construction

1.3 SUBMITTALS

A. General: Provide all submittals, including the following as specified in Division 1.

B. Certification: Submit certificates of compliance for preservative treated lumber, fire retardant treated lumber and lumber grades.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle all products and materials as specified in Division 1 and as follows:

B. Storage and Protection: Store lumber indoors at the site on raised platforms. If outdoor storage is temporarily incorporated, set the material on raised platforms

and cover with suitable weatherproof protective coverings, such as tarpaulins or heavy polyethylene film. Battened down covers with sufficient weights, ties or anchors to prevent blowoffs.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Provide lumber for rough carpentry such as nailers, grounds, blocking and framing of Construction Grade, thoroughly seasoned dry No. 1 white fir, ponderosa pine, spruce, or hem-fir.Preservative Treatment: Pressure treat all lumber for rough carpentry which is incorporated into the finished structures. Provide pressure-treated lumber complying with the requirements established in the latest AWPA P5 and TT-W-571. Use water-borne preservative with 0.25 (0.40) percent retainage. Brand all lumber accordingly.

B. Fire Retardant Treatment: Pressure-impregnate all wood designated to be fire-retardant treated with a flameproofing complying with the requirements of AWPA Type A and with U.L., Inc. requirements for flame spread of 25 or less with no evidence of significant progressive combustion when tested in accordance with ASTM E 84. Provide each piece of wood bearing the U.L., Inc. FRS Label or the U.L., Inc. label indicating complete compliance with the fire hazard classification.

C. Code Conformance: Unless otherwise indicated, provide materials conforming to the requirements of the National Design Specification for Stress Grade Lumber as recommended by the National Forest Products Association.

D. Product Standards: Provide plywood conforming to the requirements of the American Plywood Association.

E. Grading: Provide each panel of plywood identified with the appropriate DFPA grade mark of the American Plywood Association.

F. Exterior Plywood Uses: Provide exterior type plywood where plywood used for roof sheathing or decking or in areas where it may be exposed to moisture.

G. Temporary Protection: Provide an exterior type southern yellow pine plywood for temporary protection, APA Grade C, plugged fir.

2.2 ACCESSORIES

A. Provide anchors, connectors, and fastenings, not indicated, or specified otherwise, of the type, size and spacing necessary to suit the conditions encountered and as recommended by National Forest Products Association. Provide sizes, types, and spacing of nails, screws, or bolts for installation of manufactured building materials, as recommended by the product manufacturer, unless indicated or specified otherwise.

1. Zinc-electroplated steel rough hardware exposed to the weather unless indicated otherwise. Provide zinc-electroplated steel bolts, nuts, washers,

hangers, and straps, and for all other rough hardware embedded in, or in contact with exterior walls or slabs, and located in humid areas, except as indicated otherwise.

2. Form and punch rough hardware before coating. Use common steel wire nails, bright finish, unless specified otherwise.

3. Provide bolt heads and nuts bearing on wood with standard steel washers.

4. Provide galvanized fasteners for treated wood.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Install rough carpentry in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.

B. Erection: Correctly lay out all carpentry throughout. Coordinate the Work of all built-in anchors and other devices. Carefully fit and erect, accurately locate, plumb, level, properly align, and rigidly secure in place all items of woodwork, hardware, and other work in connection with carpentry.

C. Protection of the Work: Protect the jambs of finished door frames and finished masonry openings to a height of 6 feet above the floor. Erect protection in a manner to facilitate cleaning, painting, and similar work without damage to finished work.

D. Centers: Provide centers, where required, for brick and other masonry at the exterior and interior openings.

E. Blocking: Furnish blocking required for the attachment of copings, roof ventilators, ducts and other sheet metal work and wood grounds for other work and as shown and required.

F. Securing Finished Work: Provide all wood blocks, strips, plugs, and similar items required to secure finished work to concrete and masonry.

G. Preservative Coating: Liberally coat all field-cut edges and surfaces of treated lumber with a concentrated solution of preservative.

END OF SECTION

SECTION 07 18 00

TRAFFIC TOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Waterproof traffic bearing deck covering.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 03 31 00 - Cast In Place Concrete
2. Section 07 51 16 - Built-Up Coal Tar Roofing
3. Section 07 53 00 - PVC Roofing

1.2 SUBMITTALS

A. Provide all submittals, including the following, as specified in Division 1.

1. Submit the manufacturer's written approval of the applicator.

2. Submit color charts of the manufacturer's full range of standard colors for selection and approval.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Application: Do not apply traffic topping during either freezing or inclement weather or when such weather can logically be expected. Apply only to surfaces containing 7 percent or less moisture content.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. General: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.

1. Traffic Topping.

a. Crossfield Products Corp., Oak Brook, IL - "Dex-O-Tex Weatherwear"

B. Experience: Provide a traffic topping produced by a manufacturer who has been regularly engaged in topping manufacture for at least 5 years.

2.2 MATERIALS

1. Provide a 3/16- to 1/4-inch thick waterproof neoprene composition traffic bearing deck surfacing with a slip sheet and integral flashing and weighing a minimum of 2.5 pounds per square foot.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Install traffic topping in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.

B. Application: Apply the traffic topping to a uniform minimum 3/16-inch thickness and in accordance with the manufacturer's recommendations.

1. Apply traffic topping to the exposed concrete on the concrete fuel island and the concrete pavement 3 feet around the perimeter of the fuel island.

END OF SECTION

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SECTION 09 96 00

HIGH PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: field painting of new structures, .

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1.	SSPC	-	The Society for Protective Coatings
	SSPC-SP 1	-	Hand Tool Cleaning
	SSPC-SP 3	-	Power Tool Cleaning
	SSPC-SP 5	-	White Metal Blast Cleaning
	SSPC-SP 6	-	Commercial Blast Cleaning
	SSPC-SP 10	-	Near-White Blast Cleaning
	SSPC-SP 11	-	Power Tool Cleaning to Bare Metal
	SSPC-SP 13	-	Surface Preparation of Concrete
	SSPC-SP 16	-	Brush-off Blast Cleaning of Non-Ferrous Metals
2.	FS-TT-V-51F	-	Asphalt Varnish
3.	NSF/ANSI Standard 61	-	Drinking Water System Components
35.	ASME A13.1	-	Scheme for the Identification of Piping Systems
6.	ASTM D4263	-	Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
7.	ASTM E-1795	-	Standard Specification for Non-Reinforced Liquid Coating Encapsulation Products for Leaded Paint in Buildings

8. NACE SP0178 - Standard Practice for Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service

9. NAFP 500-03 - Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings

1.3 SUBMITTALS

A. Provide all submittals, including the following, as specified in Division 1.

1. Submit manufacturer's standard color chart for color selection.

2. Where equipment is customarily shipped with a standard finish, submit samples of the proposed color and finish for approval prior to shipping.

3. Furnish affidavits from the manufacturer certifying that materials furnished conform to the requirements specified and that paint products have been checked for compatibility.

4. Submit a supplementary schedule of paint products with mil thickness and solids by volume, including all paint applied in the shop and in the field. Provide a schedule that is in accordance with the recommendations of the paint manufacturer.

5. Furnish affidavits from the manufacturer certifying that coatings in immersion service contain no water soluble solvents or corrosion inhibitive (active) pigments with slight water solubility.

1.4 PAINTING REQUIREMENTS

A. Shop Primed and Field Painted Items: Furnish the following items shop primed and field painted: structural steel and wrought metals, composite metal floor deck, hangers and supports.

1.5 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:

B. Delivery and Storage: Deliver and store paint at the site from the approved manufacturer only.

C. Packaging and Labeling: Prepare, pack and label paints, stains, varnish or ingredients of paints to be used on the job. Deliver all material to the site in original, unbroken containers.

D. Storage: Store the painting materials at the site in accordance with applicable codes and regulations and in accordance with manufacturer's instructions. Keep the storage space clean at all times. Take every precaution to eliminate fire hazards.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.

1. Paint - General:

a. AkzoNobel (Ceilcote, Devoe, Enviroline, International)

b. TNEMEC Incorporated.

c. PPG Industries, Inc.

2.2 MATERIALS

A. General: Furnish paint and other materials of the type and quality of the manufacturer on which the painting schedule specified herein is based.

1. Provide compatible shop and field coats.

2. Provide all coats of paint for any particular surface from the same manufacturer.

3. Provide coatings, including paints, primers and materials in contact with potable water listed by NSF International under Standard 61 for materials and products in contact with potable water.

4. Provide paint of approved color as selected from the manufacturer's standard range of colors.

B. Paint Schedule: Provide all painting in accordance with the following schedule with the number of coats not less than the number shown on the schedule. Final thickness of coatings shall be per manufacturer requirements.

Class of Work	Surface Preparation	1st	2nd	3rd	DFT
Steel-Structural:					
Exterior	SSPC-SP 6	A	A		8.0-16.0

Pavement Marking:

Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of no more than 15 minutes.
1. Colors: Yellow and/or White.
2. Glass Beads: AASHTO M 247, Type 1.

C. Schedule of Paints: Alphabetical designations in the following list are given solely for the purpose of indicating the type and quality of materials desired. Equivalent material from other approved manufacturers may be submitted for approval.

Symbol	Product Name and Number	Volume Solids %	Dry Film Thickness Mils Per Coat	VOCs (g/L)
A	International Paint-Devoe Coatings Devthane 359	60	4.0-6.0	2.83

PART 3 EXECUTION

3.1 REPAIR

A. Notify the ENGINEER of all pits with a depth greater than 1/4 inch to determine whether structural repairs are necessary. Repair such pits in a manner approved by ENGINEER.

3.2 PREPARATION

A. Inspection: Prior to surface preparation perform the following:

1. Verify that surface substrate conditions are ready to receive Work as instructed by the product manufacturer.

2. Examine specifications for all Work and become thoroughly familiar with all provisions regarding painting.

3. Document conditions of substrate prior to beginning work. Indicate any damaged or deficient substrates requiring repair and report findings to the ENGINEER.

B. Surface Preparation: After inspection and prior to painting, perform the following:

1. Inspect all Work prior to application of any paint or finishing material.

2. Prepare the surface to be painted in accordance with the instructions of the manufacturer, the latest edition of AWWA D102 and as approved.

3. Thoroughly clean surfaces to be given protective coatings.

4. Refinish shop-coated equipment that has scratches and abrasions.

5. Do not begin field painting prior to approval of the surface preparation.

6. Prepare and clean all surfaces prior to painting, as specified and required. Verify that surfaces are dry before any paint is applied. Perform special surface preparation work as directed by the manufacturer of the paint specified to be applied to the surface.

7. Clean the surface of structural steel, exterior and interior dry surfaces of water storage tanks and steel encased in concrete, masonry or spray-on fireproofing by removing all rust, mill scale, oil, grease or dirt in accordance with SSPC-SP 6.

8. Prior to painting steel, grind smooth all welds, beads, blisters or protuberances per NACE SP0178, other than identification markings and remove other imperfections. Remove all rust, mill scale, oil, grease and dirt by abrasive blasting in accordance with SSPC-SP 6 unless otherwise indicated.

9. Prime cleaned metal the same day immediately after sandblasting to prevent rusting.

3.3 INSTALLATION

A. General: Install all painting and coatings in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.

1. Refer to manufacturer’s guidelines as it relates to minimum/maximum allowable temperatures for application.

2. Do not apply coatings to steel surfaces when the temperature of the steel is at or below 5 degrees F above the dew point.

3. Paint surfaces in accordance with the material painting schedule included in this Section.

4. Completely cover all surfaces to be painted. Cover by additional coats when color on undercoats shows through the final coat of paint, until paint is of uniform color and appearance and coverage is complete.

5. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

6. Provide sufficient temporary ventilation during painting operations in enclosed areas to remove moisture and solvents, and to keep the atmosphere safe from harmful or dangerous fumes and dust levels for personnel.

B. Touch-Up Shop-Primed and Finished Items: Touch-up all damaged portions and imperfections in shop-primed and finished items. Use the same paint as used for the shop prime and finish. Prepare the surface prior to touch-up by wire brushing and sanding to remove rust, scale and loose paint per SSPC-SP 2, 3, or 11, as determined by each situation.

C. Field Painting: Perform field painting at the job site as follows:

1. Mix all paints and similar materials in approved containers of adequate capacity.

2. Mix all paint thoroughly before being taken from the containers. Keep mixed while painting. Apply all ready-mixed paint exactly as received from the manufacturer without addition of any kind of drier or thinner, except as specified, to mix colors to conform to approved color schedule. Tint successive coats of paint to make various coats easily distinguishable. Tint undercoats of paint to the approximate shade of the final coat of paint.

3. Use only skilled painters on the Work, and employ specialists where required. Apply paint by brush, roller or sprayer in accordance with the manufacturer's recommendation.

4. Thoroughly and uniformly sand undercoats on hollow metal Work with No. 240 grit sandpaper or equal abrasive to remove all surface defects and provide a smooth, even surface. Do not allow brush marks or other irregularities on finished surfaces.

5. Perform painting as a continuous and orderly operation to facilitate adequate inspection. Prime coat and paint materials subject to weathering or corrosion before erection. Perform all paint application methods in accordance with the instructions of the paint manufacturer and as approved.

6. Fully protect areas under and adjacent to painted work at all times and promptly remove dripped or spattered paint.

7. Repair, refinish and repaint any adjacent surfaces that have been damaged or discolored by overspray.

8. Do not paint when the air or surface temperature is below that recommended by the manufacturer, or in dust-laden air, or until moisture on the surface has completely disappeared. If necessary, provide sufficient heating and

ventilation to keep the atmosphere and all surfaces to be painted dry and warm until each coat of paint has hardened.

9. Remove any painting found defective. Touch-up and provide remedial painting as directed and as required until completion and acceptance of final work.

3.4 HEALTH AND SAFETY

A. Introduction

1. Products listed in this specification and used in high-performance coatings situations contain high volume solids; the aerosol droplets/particulates produced during airless spray of some of these materials may form an explosive mixture with air and additionally may contain materials which may necessitate personal protection against potential health hazards. A summary of the main precautions to be taken includes:

a. Danger of explosion or fire

b. Provision of a suitable breathing environment for workers.

c. Prevention of skin irritation problems.

d. Use of paints which have been specially formulated for use in tanks.

B. Consult with manufacturer prior to commencing work to review recommended Health and Safety procedures.

3.5 QUALITY CONTROL

A. General Coatings:

1. At least daily, check temperature, humidity, and Dew Point as to time and readings obtained. Submit “Paint Inspection: Daily Coating Inspection Report” to ENGINEER on a daily basis. See Supplement below.

2. Perform daily wet film thickness readings or spreading rate checks to make certain that proper film thickness is being achieved. If proper film thickness is not being achieved more frequent checks may be required by the ENGINEER at their discretion. Provide daily written report to ENGINEER. Correct any deficiencies in film thickness by application of additional paint. See Supplement below.

3.6 CLEANING AND FINAL TOUCH UP PAINTING

A. Touch up and restore any damaged finish. Remove paint or other finishes spilled, splashed or splattered from all surfaces taking care not to mar any surface or item being cleaned.

3.7 SUPPLEMENT

A. The supplement listed below is a part of this Specification:

1. Paint Inspection: Daily Coating Inspection Report

Paint Inspection:

Daily Coating Inspection Report

Project/Client:	Date: / / M T W Th F S Su	Pg. Of
Location:	Project #:	COPY To: ☐ QC Mgr ☐ Owner ☐ Contr ☐ _____
Description:	Inspector:	Attachments: ☐ DFT Sheet ☐ NCR/CAR ☐ _____
Requirements:		
Contractor:	Spec #	Revision #

Description of Areas & Work Performed

Hold Point Inspections Performed

- ☐ 1 Pre Surface Pep/Condition & Cleanliness
- ☐ 2 Surface Preparation Monitoring
- ☐ 3 Post Surface Preparation/Cleanliness & Profile
- ☐ 4 Pre Application Prep/Surface Cleanliness
- ☐ 5 Application Monitoring/Wet Film Thickness (WFT)
- ☐ 6 Post Application/Application Defects
- ☐ 7 Post Cure/Dry Film Thickness (DFT)
- ☐ 8 Nonconformance/Corrective Actions Follow-up
- ☐ 9 Final Inspection

Approved By: _____

Surface Conditions

☐ New ☐ Maint ☐ Primer/Paint ☐ Age/Dry/Cure_____
☐ Steel ☐ Galvanize ☐ Concrete ☐ Other_____
☐ Hazard _____ ☐ Sample Report # _____
☐ Degree of contamination: _____
Test: ☐ Cl_____ µg/cm² / ppm ☐ Fe ____ppm ☐ pH _____
☐ Degree of Corrosion: _____
☐ Scale ☐ Pitting/Holes ☐ Crevices ☐ Sharp Edges
☐ Weld_____ ☐ Moisture ☐ Oils ☐ Other_____
☐ Painted Surface Condition: _____
Dry to: ☐ Touch ☐ Handle ☐ Recoat
☐ Dry/Over Spray ☐ Runs/Sags ☐ Pinholes ☐ Holidays
☐ Abrasion ☐ Fall Out ☐ Other _____

Surface Preparation

Start Time: Finish Time: Est Sq/ft:
☐ Solvent Clean ☐ Hand Tool ☐ Power Tool
☐ HP Wash PSI_____ ☐ Other _____
☐ Abrasive Blast ☐ Abrasive Type _____ ☐ Sample
☐ Blast Hose Size _____ ☐ Nozzle Size / PSI _____
☐ Air Supply CFM _____ ☐ Air Supply Cleanliness
☐ Water/Oil Trap Check ☐ Equipment Condition Check

Surface Cleanliness & Profile Measurement

☐ Job Specification ☐ SSPC/NACE - SP- _____
☐ SSPC/NACE Spec / Visual Stds ☐ _____
Profile Check: _____ ☐ Disc ☐ Tape ☐ Gauge
☐ Specified_____mils avg. / Achieved _____mils
☐ Surface effect on DFT Gauge/BMR_____mils

Dry Film Thickness

Gage Type / Model	Gage Serial #	Gage Calib. Verified	Spec Avg. DFT	Total Avg DFT	DFT Last Coat	DFT This Coat

Ambient Conditions

Time (Indicate AM or PM)	:	:	:	:
Dry Bulb Temp° (C/F)	°	°	°	°
Wet Bulb Temp° (C/F)	°	°	°	°
% Relative Humidity	%	%	%	%
Surface Temp° (C/F) Min/Max	/ °	/ °	/ °	/ °
Dew Point Temp° (C/F)	°	°	°	°
Wind Direction/Speed				
Weather Conditions:				

Application

Start Time : Finish Time : Est. Sq/ft.
☐ Primer ☐ Intermediate ☐ Topcoat ☐ Touch-up

Generic Type:	Qty Mixed:
Manuf.:	Mix Ratio:
Prod Name:	Mix Method:
Prod #:	Strain/Screen:
Color:	Material Temp: °F
Kit Sz/Cond.:	Sweat-in Time: Min/Hrs
Shelf Life:	Pot Life: Min/Hrs

Batch #'s

(A)	Qty Added: Pt/Qt/Gal
(B)	% by Vol: %
(C)	Specified WFT Avg: Mils
Reducer:	Achieved WFT Avg: Mils

☐ Airless/Conv. Spray ☐ Brush ☐ Roller ☐ Other _____

Pump Pot	Hose Dia.	Air Check
Ratio/Size	Hose Lng.	SEP/Trap
GPM/CFM	Spray Gun	Filter
PSI	Tip Sz.	Agitator

Inspector's Signature Date

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 10 44 16

FIRE EXTINGUISHERS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and heavy duty outdoor fire extinguisher cabinets.

1.2 QUALITY ASSURANCE

A. Provide portable fire extinguishers and accessories by one manufacturer.

B. UL-Listed Products: Provide fire extinguishers that are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher.

1.3 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Failure of hydrostatic test according to NFPA 10.
    b. Faulty operation of valves or release levers.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Amerex Corporation.

    b. Ansul Incorporated.

    c. JL Industries, Inc.; a division of the Activar Construction Products Group.

    d. Larsens Manufacturing Company.

    e. Potter Roemer LLC.

2. Valves: Manufacturer's standard.

3. Handles and Levers: Manufacturer's standard.

4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type: Dry-Chemical Type UL-rated 20-A:120-B:C, 20-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-aluminum container.

2.3 HEAVY DUTY OUTDOOR FIRE EXTINGUISHER CABINETS

A. Cabinet: Manufacturer's standard galvanized steel, designed to securely house a fire extinguisher to an exterior wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Amerex Corporation.

b. Ansul Incorporated.

c. JL Industries, Inc.; a division of the Activar Construction Products Group.

d. Larsens Manufacturing Company.

e. Potter Roemer LLC.

2. Cabinet: Non-rated heavy duty construction in type and size to fit extinguishers.

a. Material: 16 gauge steel

b. Hinge: Full length 304 stainless steel piano hinge

c. Construction: Sloped roof to facilitate drainage

d. Finish: Baked red enamel

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Engineer.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Cabinet: 54 inches above finished floor to top of fire extinguisher.

B. Cabinets: Fasten cabinets to surfaces, square and plumb, at locations indicated.

3.3 SERVICE

A. Determine the approximate completion date of the work and then inspect, charge, and tag the fire extinguishers at a date not more than 10 days before or not less than one day before actual completion date of the work.

END OF SECTION

SECTION 10 73 00

PRE-ENGINEERED STEEL CANOPY SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Description of work: 30-feet wide by 60-feet long with a 16-feet high clearance pre-engineered Steel Canopy System, as shown on the drawings, as specified herein, and as needed for a complete and proper installation.

B. Section includes the following:

1. Structural framing.
2. Roof panels.
3. Fascia panels.
4. Accessories and trim.
5. Canopy concrete foundations and accessories.

C. Related Work Specified in Other Sections Includes, But is Not Limited to, the following:

1. Section 03 31 00 – Cast in Place Concrete
2. Section 09 96 00 – High Performance Coatings

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide a complete metal overhead canopy system, manufacturer's standard mutually dependent components and assemblies that form a metal overhead canopy system. The metal overhead canopy system must be capable of withstanding structural and design loads, thermally induced movement, and exposure to weather without failure. Include primary and secondary framing, roof and wall panels, and accessories complying with requirements indicated, including those in the specifications and contract drawings. Provide the design for concrete foundations to be installed by the General Contractor.

1. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and with a 30-minute working time. Shrinkage-Resistant Grout to be provided and installed by the General Contractor.

B. Metal Overhead Canopy System Design: Of size, spacing, slope, and spans indicated, and as follows:

1. Frame Type: Fixed Base Cantilevered Steel Tube Columns
2. Clear Height: as indicated by nominal height on drawings.
3. Support Locations: as indicated on drawings.
4. Roof System: Manufacturer's standard lap-seam roof panels.
5. Secondary Frame Type: Manufacturer's standard.

C. Structural Performance: Provide metal canopy systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Design Loads: As indicated on the Structural Drawings
2. Live Loads: As indicated on the Structural Drawings
3. Wind Loads: Include horizontal loads induced by a basic wind speed as required for the location of the project and per the 2021 International Building Code and all other codes and standards in effect for the project.
4. Collateral Loads: Include additional dead loads other than the weight of overhead canopy system for permanent items.
5. Load Combinations: Design metal canopy systems to withstand the most critical effects of load factors and load combinations.
6. Deflection Limits: Based on Manufacturer standards.

1.3 REFERENCES

A. Codes and standards referred to in this Section are:

1. AAMA 2605 - Standard For Organic Coatings On Architectural Aluminum Extrusions

2. ASTM A 325 - Standard For High Strength Weathering Steel Fasteners

3. ASTM A 529 - Standard High Strength Carbon Steel-Manganese Steel Shapes

4. ASTM A653 - Standard For Galvanized Steel Sheet

5. ASTM A 755 - Standard For Steel Sheet, Metallic Coated By The Hot-Dip Process And Pre-painted By The Coil-Coating Process For Exterior Exposed Building Products

6. ASTM A 992 - Standard For Wide Flange-Beams

7. ASTM C 297 - Standard For Tensile Strength Of Sandwich Constructions

8. ASTM D 1781 - Standard For Climbing Drum Peel For Adhesives

9. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials

1.4 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of the following metal canopy system components:

1. Structural-framing system.
2. Roof panels.
3. Fascia panels.
4. Drainage System.

C. Shop Drawings: For the following overhead canopy system components. Include plans, elevations, sections and details.

1. For installed components indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Anchor-Bolt Plans: Include location, diameter, and projection of anchor bolts required to attach metal canopy to foundation.
3. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
4. Roof Layout Drawings: Show layouts of panels on support framing, details of edge conditions, joints, panel profiles, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work.
5. Concrete footing details.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of the following products with factory-applied color finishes:

1. Deck panels.
2. Fascia Panels

E. Product Certificates: Signed by manufacturers of metal canopy systems certifying that products furnished comply with requirements.

1. Letter of Design Certification: Signed and sealed by a qualified professional engineer.
    a. Include the following:
    b. Name and location of Project.
    c. Name of manufacturer.
    d. Overhead Canopy dimensions, including width, length, and height.
    e. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
    f. Governing building code and year of edition.
    g. Design Loads: Include dead load, roof live load, roof snow load, wind loads/speeds and exposure and seismic design category.
    h. Building-Use Category: Indicate category of building use and its effect on load importance factors.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, must have an annual audit and review of their quality assurance program, and other information specified.

G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Erector Qualifications: An erector with a minimum of fifteen years of experienced who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to the manufacturer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Illinois and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal canopy systems that are similar to those indicated for this Project in material, design, and extent.

C. Manufacturer Qualifications: A minimum of twenty years of experienced in manufacturing overhead canopy systems similar to those indicated for this Project and with a record of successful in-service performance.

    1. Engineering Responsibility: Engineering analysis by a qualified professional engineer.

D. Welding: Qualified procedures and certified welding personnel according to AWS D1.1, "Structural Welding Code Steel".

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package roof and wall panels for protection during transportation and handling.

B. Handling: Unload, store, and erect roof and wall panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weather tight and ventilated covering. Store roof and wall panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit roof and fascia panel installation to be performed according to manufacturer's written instructions and warranty requirements.

1.8 COORDINATION

A. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

B. Site Conditions: Must meet manufacturer’s Required Job Site Conditions for Installation.

1. Anchor bolts must be installed per erection drawings. Footings need to be free of debris and anchor bolt threads undamaged.
2. All work surfaces must be even with no exposed product lines.

1.9 WARRANTY

A. General Warranty: Provide special warranties specified in this Article to not deprive Owner of other rights. Owner may have under other provisions of the Contract Documents and are to be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1. Warranty Period: One year from date of Substantial Completion.

B. Special Warranty on Panels: Written warranty, executed by manufacturer agreeing to repair or replace roof and fascia panels that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

C. Special Warranty on Deck Finish: Written warranty, signed by manufacturer agreeing to repair finish or replace decking that show evidence of deterioration of finishes within specified warranty period. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking peeling, and loss of film integrity.

1. Warranty Period for Deck Finish: 20 years from date of Substantial Completion.

D. Special Warranty on Panel Finishes: Written warranty, signed by manufacturer agreeing to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking peeling, and loss of film integrity.

1. Warranty Period for Roof Panels: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted, other manufacturers of equivalent products may be submitted.

1. TFC Canopy, a division of Centurion Industries, Inc. Garrett, IN

2. Austin Mohawk. Utica, NY

3. McGee Corporation. Matthews, NC

2.2 STRUCTURAL FRAMING MATERIALS

A. Structural-Steel Shapes: ASTM A 992/A 992M 50.0 ksi minimum yield strength.

B. Steel Plate, Bar, or Strip: ASTM A 529/A 529M; 50.0 ksi minimum yield strength.

C. Structural square HSS tube steel: A500 grade B; 46.0 ksi minimum yield strength.

D. Structural round HSS tube steel: A500 grade B; 42.0 ksi minimum yield strength.

E. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Grade 40, with G60 (Z180) coating designation.

F. Metallic-Coated Steel Sheet Pre-painted with Coil Coating: Steel sheet metallic coated by the hot dip process and pre-painted to comply with ASTM A 755/A 755M and the following requirements:

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Grade 40, with G60 (Z180) coating designation.

G. High-Strength bolt assemblies: ASTM A 325/ASTM A 325M, Type 1.

1. Finish: Uncoated.

H. Anchor Rod assemblies: ASTM F1554, Grade 55.

1. Finish: Uncoated.

I. Primers: As selected by manufacturer for resistance to normal atmospheric corrosion, compatibility with finish paint systems, capability to provide a sound foundation for field-applied topcoats as follows:

1. Primer: Manufacturer's standard, lead- and chromate-free, non-photochemically reactive, rust-inhibiting primer.

2.3 DECK MATERIALS

A. Metallic-Coated Steel Sheet Pre-painted with Coil Coating: Steel sheet metallic coated by the hot dip process and pre-painted with polyester paint and compatible primer on the face side and wash coat on the back side by the coil-coating process to comply with ASTM A 755/A 755M and the following requirements:
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G60 (Z180) coating designation; Grade 40.
2. Surface: Smooth, flat, mill finish.

2.4 FABRICATION, GENERAL

A. General: Design components and field connections required for erection to permit easy assembly and disassembly.

1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
2. Fabricate framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Provide cold-formed members to be free of cracks, tears, and ruptures.

B. Primary Framing: Shop-fabricate framing components to indicated size and section with base plates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

1. Make shop connections by welding or by using high-strength bolts.
2. Brace compression flange of primary framing by angles connected between frame web and purlin or girt, so flange compressive strength is within allowable limits for any combination of loadings.
3. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary structural members with specified primer after fabrication.

C. Secondary Framing: Shop-fabricate framing components to indicated size and section by roll forming or break-forming, with base plates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

1. Make shop connections by welding or by using non-high-strength bolts.
2. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime secondary structural members with specified primer after fabrication.

2.5 STRUCTURAL FRAMING

A. Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads, fabricated from shop-welded, built-up steel plates or structural-steel shapes.

B. Provide frames with attachment plates and splice members, factory drilled for field-bolted assembly.

C. Bracing: Provide lateral bracing.

D. Fixed-Base Columns: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.

2.6 ROOF PANELS

A. 20 gauge x 16” wide x 3” smooth or embossed steel panels.

B. Roof Panel Accessories: Provide components required for a complete roof panel assembly including trim, copings, corner units, clips, seam covers, battens, flashings, gutters, sealants, fillers, closure strips, and similar items. Match materials and finishes of roof panels, unless otherwise indicated.

C. Provide panels to have a finish side coated with a full coat of polyester paint baked on over a polyester primer. Provide reverse side to be protected by a whitewash coat baked on over a polyester primer.

2.7 COMPOSITE METAL FASCIA PANELS

A. Composite metal fascia panel materials

1. Core: Thermoplastic material that meets performance characteristics specified when fabricated into composite assembly.

2. Face Sheets: Aluminum alloy 3105 H14, 0.020 inch (0.51 mm) thick with a fluoropolymer paint finish that meets or exceeds values expressed in AAMA 2605.

3. Bond Integrity: Tested for resistance to delamination as follows:
   a. Bond Strength (ASTM C297): 1500 psi (10.3 MPa) minimum.
   b. Peel Strength (ASTM D1781): 22 in-lb/in (100 N-m/m) minimum.
   c. No degradation in bond performance after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F (21 degrees C).

4. Fire Performance:
   a. Flamespread (ASTM E84): 5 maximum.
   b. Smoke Developed (ASTM E84): 15 maximum.
   c. Comply with UL 879
   d. V-O Rating: Comply with UL 94.

B. Production Tolerances:
1. Width: +/- 0.04 inch/3 feet (1 mm/m).
2. Length: +/- 0.04 inch/3 feet (1 mm/m).
3. Thickness (3 mm Panel): +/- 0.008 inch (0.2 mm).
4. Bow: Maximum 0.5% length or width.
5. Squareness: Maximum 0.2 inch (5.1 mm).
6. Edges of sheets to be square and trimmed with no displacement of aluminum sheets or protrusion of core material.

C. Panel Thickness: 3 mm

D. Composite metal fascia panels accessories
1. General: Provide fabricator’s standard accessories, including fasteners, clips, anchorage devices and attachments.
2. Attach fascia panel to structural frame with a cold formed channel.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean substrates of substances, including oil, grease, rolling compounds, incompatible primers, and loose mill scale that impair bond of erection materials.

B. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

3.2 ERECTION OF STRUCTURAL STEEL

A. Erect metal canopy system according to manufacturer's written instructions and erection drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal canopy system manufacturer's professional engineer.

C. Set structural framing in locations and to elevations indicated and according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base plates and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces before setting base plates and bearing plates. Clean bottom surface of base plates and bearing plates.

1. Set base plates and bearing plates for structural members on setting nuts.
2. Tighten anchor bolts after supported members have been positioned and plumbed.
3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. Comply with manufacturer's written instructions for grout materials.

E. Align and adjust framing members before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Make adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for differences between temperature at time of erection and mean temperature at which structure will be when completed and in service.

F. Primary Framing: Erect framing true to line, level, plumb, rigid, and secure. Level base plates to a true even plane with full bearing to supporting structures, set with

double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation.

1. Make field connections using high-strength bolts. Tighten bolts by turn-of-the-nut method.

G. Secondary Framing: Erect framing true to line, level, plumb, rigid, and secure. Fasten secondary framing to primary framing using clips, non-high-strength bolts, and or screws as indicated on manufacturers erection drawings.

H. Bracing: Install bracing in roof where indicated on manufacturers erection drawings.

3.3 ROOF PANEL INSTALLATION

A. General: Provide roof panels of full length when possible.

1. Field cutting by torch is not permitted.
2. Rigidly fasten eave end of roof panels and allow ridge end free movement due to thermal expansion and contraction.
3. Flash and seal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-drilling and tapping screws.
4. Install screw fasteners with power tools having controlled torque adjusted to tighten without damaging screw threads, or panels.
5. Use manufacturer supplied fasteners for exterior applications.
6. Locate and space fastenings in true vertical and horizontal alignment.

B. Deck Panels: Fasten roof panels to purlins with clip system that requires no “Thru Panel” fasteners.

1. “Deck Clips” must be tested and rated to meet the most critical effects of load factors and load combinations.

3.4 ACCESSORY INSTALLATION

A. General: Install gutters, downspouts, and other accessories according to manufacturer's written instructions, with positive anchorage and weather tight mounting. Coordinate installation with flashings and other components.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions. Provide for thermal expansion of metal units; conceal fasteners where possible and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with

exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

2. Separations: Separate metal from incompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

3.5 COMPOSITE METAL FASCIA PANELS INSTALLATION

A. General: Install Aluminum composite panels, and other accessories according to manufacturer's written instructions.

1. Install panels plumb, level and true, in compliance with fabricator's recommendations.
2. Anchor panels securely in place, in accordance with fabricator's approved shop drawings.
3. Comply with fabricator's instructions for installation of concealed fasteners and with provisions for installation of joint sealers.
4. Installation Tolerances: Maximum deviation from horizontal and vertical alignment of installed panels: 0.25 inch in 20 feet (6.4 mm in 6.1 m), noncumulative.

3.6 ERECTION AND LOCATION TOLERANCES

A. Structural-Steel Erection Tolerances: Comply with erection tolerance limits of AISC 303-05, "Code of Standard Practice for Steel Buildings and Bridges."

3.7 CLEANING AND PROTECTION

A. Touchup Painting: Immediately after erection, clean, prepare, and prime or reprime welds, bolted connections, and abraded surfaces of prime-painted primary and secondary framing, accessories, and bearing plates.

B. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.

C. Apply compatible primer of same type as shop primer used on adjacent surfaces.

D. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded surfaces of shop-painted primary and secondary framing, accessories, and bearing plates are included in Division 9 Section "Painting."

E. Roof and Wall Panels: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

F. Replace panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 13 20 01

FUEL STORAGE TANKS AND FUELING EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for furnishing and installing 15,000 gallon double wall fiberglass underground diesel and unleaded gasoline storage tanks, diesel and gasoline supply pumps, fuel dispensing system to supply vehicles with diesel fuel and unleaded gasoline, leak monitoring system, fuel management system, LED fob (typ) reader with programmable identifiers, fuel nozzle readers, tank fuel level monitoring, together with all controls including minimum 1000 device capacity, and system capable of accepting additional devices, piping and appurtenances necessary for a complete installation. Locate tanks as shown on drawings.

B. Single Source Responsibility: Provide fuel storage tanks and accessories, fuel dispensers, controls, leak monitoring system and liquid level monitoring system as a complete package by a single source supplier having overall system responsibility.

C. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 09 96 00 – High Performance Coatings
2. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables

D. Electrical Work: Provide electrical work including wiring and conduits, controls, appurtenances etc., to achieve complete installation. Provide wires between leak monitoring sensors, level measuring sensors, etc., and associated control panels. Refer to Division 26 Specification Sections.

1.2 REFERENCES

A. Codes and Standards: Codes and standards referred to in this Section are:

1. NFPA 30 - Flammable and Combustible Liquids Code

2. NFPA 31 - Standard for Installation of Oil Burning Equipment

3. ASTM E 84 - Method for Testing for Surface Burning Characteristics of Building Materials

4. OSHA - Occupational Safety and Health Act

5. ASTM C 547 - Mineral Fiber Performed Pipe Insulation

6. IEPA - Illinois Environmental Protection Agency

7. ASTM D 4021 - American Society for Testing Material

8. UL 1316 - Glass Fiber Reinforced Plastic Underground Storage Tanks for Petroleum Products

1.3 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in Division 1.

B. Manufacturer's Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation.

Include catalog cuts of hardware, anchors, fastenings, and accessories. Include manufacturer's operating instructions, and maintenance data.

C. Shop Drawings: Furnish shop drawings, including physical drawings of the equipment and arrangement and erection drawings of the equipment.

D. Quality Control Submittals: Submit manufacturer's certified performance and material record as required.

E. Catalog Data: Submit catalog data for fuel storage tanks, fuel dispensers, leak monitoring system, pumps, level monitoring system, control panels, piping, including dimensions, weights, materials and finishes, arrangements and performance characteristics.

F. Guarantee: Submit manufacturer's standard guarantee that workmanship and material are without defect, and if found defective during the one year after acceptance by the Owner, the defect will be promptly remedied without additional cost to the Owner.

1.4 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in Division 1.

B. Care: Use every precaution to prevent damage to the tanks and fueling equipment during transportation and delivery to the site. Take extreme care in loading and unloading tanks and accessories. Do such work slowly with skids and suitable power equipment and keep tanks under control at all times.

1. Do not allow the tanks to be dropped, bumped, dragged, pushed, rolled or moved in any way which will cause damage. Lift tanks only by lifting lugs provided, never by chains or slings around the tank shell.

2. If, in the process of transportation or handling, the tanks or equipment is damaged, replace or repair such tank. Make all required repairs.

C. Delivery: Ship the tank complete as package, with no field assembly or fabrication required. Field attachment of accessories to the tank is acceptable.

1.5 QUALITY ASSURANCE

A. Manufacturers: Manufacturers to have a minimum of 5 years experience in producing specified equipment and accessories and show evidence of at least 10 years of installations in satisfactory operation.

B. Testing and Inspection Agency: Materials, manufacturing procedures, and workmanship are subject to inspection and testing in the factory and field, conducted by the Testing and Inspection Agency. Such inspections and tests are not to relieve the Contractor of responsibility for providing materials and installation procedures in compliance with specified requirements.

C. Remedial Action: Promptly remove and replace materials, and workmanship found defective and provide new acceptable work in accordance with contract requirements.

1.6 WARRANTY

A. Double Wall Fiberglass Tanks: Tank Manufacturer to warrant its underground tanks to be free from defects in manufacturing, workmanship or materials and will repair or replace at the place of delivery for a period of one year after date of shipment. Tank to be warranted against internal and external corrosion for a period of 30 years from date of original purchase.

B. Fueling Equipment and Peripherals: Equipment, components, and systems such as fuel dispensers, fuel pumps, leak monitoring, fuel management, etc. to be covered under standard manufacturers warranty but not less than for a period of 5 years from completion of fueling system commissioning.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Double Wall FRP Underground Fuel Storage Tanks:

   a. Xerxes
   b. Containment Solutions

2. Fuel Dispensers:

   a. GASBOY
   b. Dresser Wayne
   c. Bennett
   d. Or equal

3. Fuel Hose Connections:

   a. A.Y. McDonald
   b. OPW

4. Fuel Supply Pumps:

   a. Red Jacket
   b. VEEDER-ROOT
   c. Franklin Electric Fueling System

5. Gravity Fill Cap and Level Stick Fitting:

   a. OPW
   b. A.Y. McDonald

6. Vent Fitting:

   a. OPW
   b. A.Y. McDonald

7. Dielectric Fittings:

   a. Watts Regulator Co.

8. Leak Monitoring and Tank Liquid Level Measuring System

   a. VEEDER-ROOT

9. Fuel Management System:

   a. GASBOY
   b. Syntech
   c. OPW

10. Piping

   a. Omegaflex Double Trac
   b. Franklin Fueling UPP
   c. Or equal

11. Observation Wells

   a. Johnson Filtration Systems
   b. Monitoring Well Sales and Services Inc.

2.2 FIBERGLASS TANKS

A. Loading Conditions:

1. Provide tanks meeting the following design criteria:

   a. External Hydrostatic Pressure: Buried in ground with seven feet of overburden over the top of the tank, the hole fully flooded and a safety factor of five to one against general buckling.

   b. Surface Loads: When installed according to the manufacturer's installation instructions provide tanks to withstand surface H-20 axle loads (32,000 lbs/axle).

   c. Internal Load: Provide the primary tank and annular space to withstand pressure test of five pounds per square inch resulting in a five to one safety factor.

d. Design tanks to support accessory equipment such as manholes, drop tubes, etc. when installed according to manufacturer's recommendations and limitations.

B. Product Storage Requirements:

1. The tanks must be vented as tanks are designed for operation at atmospheric pressure only.

2. Provide tanks capable of storing petroleum products at ambient underground temperatures at the tank interior surface.

3. Provide tanks chemically inert to petroleum products.

C. Annular Space:

1. Provide tanks to have a space between the primary and secondary shell walls to allow for the free flow and containment of all leaked product from the primary tank.

2. Design tanks to provide monitoring capability.

D. Accessories:

1. Anchor Straps: Provide glass fiber-reinforced plastic anchor straps for each tank shown. Number and location of straps to be as specified by manufacturer, as indicated on the Drawings. Provide each strap to be capable of withstanding the buoyancy load for tank diameter listed below. Straps to be standard as supplied by the tank manufacturer.

Ten Feet Diameter - 32,000 Pounds

2. Certification Plate - Underwriters' Laboratory label to be permanently affixed to each tank.

E. Flanged Manways:

1. Provide all manways at 22 inches inside diameter and 42 inch collar. Manholes to be constructed of cast iron and to be designed to withstand surface H-20 axle loads (32,000 lbs/axle).

F. Fill Tubes

1. Provide overfill drop tubes. Fiberglass fill tubes are not acceptable.

G. Deflector Plates:

1. Provide plates to be 24 inches square, steel and installed by the tank manufacturer where shown on the Drawings.

H. Fittings - Threaded - NPT:

1. All threaded fittings on UL - labeled tanks to be located in the manway covers and to be of material of construction consistent with the requirements of the UL Label. Supply all fittings with cast iron plugs.

2. All standard threaded fittings to be four inches in diameter and to be half couplings. Use reducers for smaller sizes where specified.

3. Thread Standards: All threaded fittings to have machine tolerances in accordance with the ANSI standard for each fittings size.

4. Strength: Provide fittings to withstand a minimum of 150 foot-pounds of torque and 1,000 foot-pounds of bending, both with two to one safety factor.

I. Lifting Lugs:

1. Provide each tank with lifting lugs. Provide lugs to be capable of withstanding weight of tank with a safety factor of three to one.

J. Piping Sumps:

1. Provide each manway with a fiberglass piping sump as shown on the Drawings. Design the piping sump to provide a secondary containment area for a submersible pump leak and also a termination point for the double wall piping systems.

2. Provide each sump with watertight connections for piping and electrical conduit. Provide sumps with bolt-on gasketed lids.

3. Complete each sump with a sump sensor to continuously monitor the sump for the presence of any fluid.

4. Complete sumps used for tank access only with an attachment ring.

K. Tank Level and Leak Monitoring System:

1. Provide each tank complete with a monitoring system to detect a leak in the annular space between the inner and outer walls of the tank.

2. Veeder Root TLS 450 Plus is the basis of design.

3. Systems to be as follows:

   a. Hydrostatic monitoring system capable of detecting a breach in the inner or outer wall of the tank under all installed conditions.

   b. Provide each 15,000 gallon tank with containment sumps as shown on the Drawings. Tanks to have electronic control panel with appropriate sump sensor switch panel. Panel location as shown on the Drawings. Monitoring panel to be NEMA 4X.

   c. Provide wall mounted leak monitoring panel complete with two intrinsically safe alarm channels for fuel oil storage tank monitoring. Provide panel constructed of heavy gauge steel with baked enamel finish of approved color. Provide the panel complete with audible alarms, adjustable volume horn, red alarm status lights, manual reset button, and a test button to energize audible and visual alarms all mounted on the face of the panel. Provide each alarm channel to transmit signal to tank mounted sensors.

   d. Provide secondary containment nondiscrimination leak sensor. Provide sufficient length conductor wire within a conduit from the fuel storage tanks to the leak monitoring panel.

L. Factory Tests:

1. Manufacturer to give the ENGINEER 30 day notice when standard factory tests will be made on material specified herein. Six copies of certified inspections and test certifications as are normally made available to be supplied with thirty days following the making of such tests.

2. Design Compliance and Factory Testing:

   a. Provide testing in accordance with the Contract requirements and as requested by the ENGINEER.

   b. The ENGINEER may attend and witness all factory tests.

   c. Dates to be established by the Manufacturer and meet the approval of the ENGINEER. Notify the ENGINEER at least 30 days prior to the dates involved.

d. If the Manufacturer is unable to demonstrate satisfactory performance in compliance with the Specifications in the first test, make modifications as required and re-schedule testing.

e. A copy of the Manufacturer's assurance program to be made available to the ENGINEER, prior to testing.

2.3 FUEL DISPENSERS

A. Unleaded Gasoline Dispensers: Provide dispensers to be a single product, twin hose type with a breakaway connection valve and swivel on each hose. Provide dispenser rated up to 40 gpm at discharges and to be designed to dispense gasoline including ethanol blends.

B. Features:

1. Stainless steel construction including exterior panels, bezel, top, doors, base, structural columns, and frame.
2. Product identification panels at top of cabinet.
3. Two nickel plated positive displacement two piston meters with stainless steel sleeves and Teflon piston cups.
4. Minimum 1 inch ID black iron internal piping
5. Two 1 inch discharge outlets.
6. 1 inch nickel plated brass solenoid valve for each hose outlet.
7. Explosion proof junction boxes.
8. 1-1/2 inch minimum supply inlet with stainless steel inlet strainer.
9. Dispenser to be compatible with nozzles, balance adaptors, and other related equipment.

C. Diesel Fuel Dispensers: Provide dispensers to be a single product, twin hose type with a breakaway connection valve and swivel on each hose. Provide dispenser rated up to 40 gpm at discharges and to be designed to dispense diesel.

D. Features:

1. For each hose, two positive displacements, two piston meters connected to the same discharge for maximum flow.
2. Electronic calibration without the need to set mechanical adjusters.
3. Proportional solenoid valve on discharge of each meter, programmable thru electronic register to set maximum flow rate.
4. Two internal filter with 30 micron elements.
5. Two 1 inch discharge outlets.
6. Explosion proof junction boxes.
7. Stainless steel construction including exterior panels, bezel, top, base, structural columns, and frame.
8. Lockable hinged door.

2.4 FUELING HOSE CONNECTIONS

A. Connections to be heavy brass with aluminum cap. Cap to have cam-type locking latch with provision for padlocking. Fittings and caps to have heavy chrome plating. Provide heavy gauge stainless steel chain. Attach chain to cap and pipe to prevent loss of cap.

2.5 FUEL SUPPLY PUMPS

A. Provide submersible pumps, self-lubricating, centrifugal type.

B. Pumps to be easily removed from the storage tank without disconnecting discharge piping. Provide the pumps and motor assembly readily separable from the pump column pipe to allow for simple field replacement of the pump and motor.

C. Provide pump impellers to be either splined or keyed to the pump shaft to provide positive, non-slip rotation. Provide diffusers tightly secured to the lower motor bearing housing to prevent rotation.

D. Provide pump intake to be horizontal to prevent drawing sediment from the tank bottom into the pump inlet.

E. Provide pump manifold assembly completely sealed against product leakage into the ground and exterior water leakage into the storage tank. Provide the discharge outlet to be standard three inch NPT. Provide the head to have a built-in air eliminator, check valve, relief valve nozzle and venture and siphon check valve. Locate head in the piping sump as shown on the Drawings. Design all components to facilitate disassembly and servicing from above without disrupting the discharge piping.

F. Provide the pump assembled with pump inlet and impellers at the bottom for maximum liquid draw. Mount the motor above the pump inlet, so that motor is both cooled and lubricated by the liquid flow past the motor.

G. Provide motors to be UL listed. Motors to be explosion-proof rated for use in Class I, Group D, flammable solvents, with hermetically sealed motor windings to protect against leakage of product or moisture into the motor, and to have a thermal overload device with automatic reset built into the motor for cut-off when motor temperature reached a level which may cause motor damage.

H. Provide motor with a quick-disconnect type male/female connector to be readily separable for servicing without cutting or splicing of conducting wiring.

2.6 FUEL MANAGEMENT SYSTEM

A. Provide a cloud-based, fuel management system with complete communications and controls including visibility of the fleet equipment, fuel management process, inventory monitoring, and reporting, control distribution, LED fob reader, nozzle reader, 1000 device capacity, and capable of accepting additional devices.

B. Provide a complete fuel management system for each dispenser to maintain 24 hour controlled access to fuel dispensing, activated by valid operator access. Access to product to be restricted to personnel holding valid fob.

C. Provide an internal electronic file to hold data for each fob authorized to use the system. This file is to contain personnel information on the user issued the fob. The file is to have capability to limit the amount of fuel dispensed to predetermined operator, and to restrict the type of product the user may obtain to only the type used by the equipment entered.

D. The fuel management system shall be an RFID module-ready system with nozzle readers and all required hardware for use with future RFID vehicle modules. The RFID vehicle modules are not part of this project, but may be procured by the City at a future date.

2.7 FUEL STORAGE TANK LEVEL MEASURING SYSTEMS

Veeder Root TLS 450 Plus is the basis of design.

2.8 FUEL STORAGE TANK SPECIALTIES

A. Gravity Fill Cap and Level Stick Fittings:

1. Fill cap to be four inch and have a cast iron collar with a bronze cap. Gasket to be chromed tanned leather.

B. Vent Fitting:

1. Vent to be three inch size with aluminum body and cover and 40 mesh brass screen.

2.9 FUEL PIPING AND SPECIALTIES

A. General: Provide double-contained piping system compliant with all applicable codes and local requirements.

B. Backfill: Place a 4-inch layer of sand or fine gravel and tamped in the trench to provide a uniform bedding for the containment pipe. The entire trench to be evenly backfilled with a similar material as the bedding in 6 inch compacted layers to a minimum height of 6 inches above the top of the piping system. The remaining trench to be evenly and continuously backfilled in uniform layers with suitable excavated soil.

C. Pipe Marking: Provide pipe markings to identify pipe content, direction of flow and all else required for proper marking of pipe.

2.10 OBSERVATION WELLS

A. Casing: Provide the well casing to be new 4-in ID Type 304 stainless steel pipe.

B. Screen: Provide the screen to be new 4-in, Type 304 stainless steel screen with a slot size of 0.020-in. Well screens to be 10 feet in length.

C. Well Cover: All observation wells to be equipped with 12" x 12" flush-mounted, Type 304 stainless steel well cover and casing. The well cover to have the words "MONITORING WELL" cast into the cover.

2.11 FUEL PIPES AND VALVES

A. Limitations: 150 psig, 500 deg F above and below ground.

B.	Item: 2 inches and smaller	2-1/2 inches and larger
C.	Pipe: Sch. 80, black steel, plain ends, ASTM A53	Sch.80, black steel, beveled ends, ASTM A53
D.	Fittings: Schedule 80, carbon steel, butt welding, ASTM A181, Grade II	3000 lb forged steel socket welding, ASTM A234, Grade WPB
E.	Gate Valves: 200 lb. WSP - 400 lbs. WOG bronze rising stem gland packed union bonnet, threaded end stainless steel stem, disc and seat	150 lb. carbon steel, butt welded or flanged ends, OS&Y, bolted bonnet, wedge disc type with stainless steel rising stem, stainless steel faced disc.
F.	Globe Valves: 200 lb. WSP 400 lb WOG bronze rising stem gland packet union bonnet, threaded ends,	150 lb carbon steel, butt welded or flanged ends, yoke bonnet, plug disc type, stainless steel stem, nickel alloy disc.

stainless steel seat ring and disc.

G. Ball Valves: 400 lb WOG bronze body, chrome plated brass ball, TFE seats threaded or flanged ends. Class 150 lb. Carbon steel, butt welded or flanged ends, stainless steel ball. TFE seats, full port.

H. Check Valves: 200 lb WSP 400 lb WOG bronze swing check, stainless steel seat, bronze disc, threaded ends. 150 lb. carbon steel, butt welded or flange ends, swing type, stainless steel trim, outside lever and adjustable weight to assist closing.

I. Plug Valves: 150 lb. carbon steel, flanged ends, hand lever actuator.

2.12 VALVE IDENTIFICATION

A. Valve Schedule: Prepare a valve schedule for all valves required for the Work showing a number, the location, type, function, and normal operating position, for each valve.

B. Valve Tags: Furnish tags for all valves required for the Work. Valve tags to be 2-in diameter, 19 gauge, brass or plastic, with brass hooks suitable for attaching the tag to the valve operator. Tags to be stamped or etched with the valve number and the information on the valve schedule coded in a system provided by the Authority. Submit two samples of the type of tag proposed and the manufacturer's standard color chart and letter styles to the ENGINEER for approval.

C. Install valve tags on all valves required for the Work.

PART 3 EXECUTION

3.1 INSTALLATION OF FIBERGLASS TANKS

A. Testing: Prior to installation, tanks to be tested above ground at five pounds per square inch pressure for a minimum of one hour. Testing to be as required by the manufacturer. Fittings to be soaped and checked for leaks. During the test, tanks not be left unattended.

B. Lifting Tanks: Use installed lift lugs to lift tank; guide the tank with guidelines. Do not use chains or cables around tanks. If tanks have to be moved, they are to be set on smooth ground free of rocks and foreign objects and rechecked. Capacity of lifting equipment to be checked before installation.

C. Installation: Installed fiberglass underground storage tanks according to the most recent issue of Manufacturers Installation Instructions and NFPA Publications 30 and 31.

D. City of Evanston codes, and local regulations to apply and to be consulted.

E. Hole Size: Determine if ground will provide stable or unstable wall condition and follow manufacturers recommendations for hole size.

F. Installation Procedure:

1. Tanks never to be left on the bed without backfill to the top of tank if there is any chance of more than 12 inches of water in the hole.

2. Tanks installed with backfill to the top of the tank to be filled with water as ballast. Do not add water in tank before backfill material is even with top of tank. Backfilling operation to top of tanks and filling tanks with water a minimum of two-thirds full to be completed within one day's shift. Fuel supply pumps not to be installed when there is water in the tank.

3. Complete backfilling with approved backfill. Be sure backfill is free of large rocks, debris or foreign materials that could damage the tank. Avoid impacting tanks during the backfilling.

4. Caution: Bricks or blocks used to support piping must be removed prior to filling to grade. Do not use rock, shale or debris for fill.

5. Tank area to be barricaded to prevent any vehicle travel over the tanks.

G. Anchoring:

1. Use fiberglass hold-down straps in the location as designated by the manufacturer. Anchor points to be equal to tank diameter plus one foot on each side of tank, regardless of diameter of tank. Anchor points at bottom of hole to be aligned with designated strap location plus-or-minus one inch. All straps to be tightened with turnbuckles to give "snug" fit of strap to tank.

2. Anchors to be as shown on the Drawings.

H. Filling Tanks: Near completion of work and when directed by the ENGINEER, remove water from all tanks. Install fuel supply pumps only after tanks have been emptied.

I. Coating:

1. Heavily coat turnbuckles, all metallic anchor components and all tank metallic fittings etc. with one bitumastic primer coat and two coats of coal tar coating. Use heavy duty spray equipment for primer and coal tar applications. Brush or roller application will not be permitted. Allow twenty-four hour drying time between coating and prior to backfilling.

3.2 OBSERVATION WELL INSTALLATION

A. General: Install all well casings plumb and true to line. The finished well depth will be approximately 1 foot below the tank bottom. If in the opinion of the ENGINEER, the well might be out of plumb or alignment, the well to be tested at the Contractor's expense. The well screen to be located at the bottom of the well.

B. Casing and Screens: Set all casing and screens to final depths as selected by the ENGINEER. The string of casing and attached screen to be secured approximately one foot above the bottom of the borehole to allow the gravel pack to form beneath the well screen. Flush threaded casing and screen to be installed by screwing successive sections together. The use of pipe dope or lubricant, such as oil or grease, is not permitted on threaded.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide the services of a qualified representative of the tank and fueling equipment, including fuel management system, manufacturers to inspect the installation and testing of the equipment, make any necessary adjustment, place it in initial trouble-free operation, and instruct the operating personnel and maintenance.

3.4 LEAKAGE TESTING

A. Testing: Pressure test the piping with fuel for leakage as a whole or in sections, valved or bulkheaded at the ends.

B. Test Pressure: Test the piping at the test pressures as recommended by the manufacturer.

C. Allowable Leakage: Stop all visible leakage. Do not allow leakage for any piping.

D. Procedures: Repair leaks as follows:

1. Replace broken pipe or joint assemblies found to leak.

2. When leakage occurs in excess of the specified amount, locate and repair defective valves, pipe, cleanouts or joints.

3. If the excess leakage is determined to be caused by defective materials furnished, improper workmanship, or damage to the materials, make the necessary repairs or replacements at no addition to the Contract Price.

3.5 COMMISSIONING SERVICES

A. Provide the services of a qualified representative of the fueling system manufacturer to provide instruction on proper installation of the equipment, and to instruct the operating personnel in the operation and maintenance, inspect the completed installation, make any necessary adjustments, participate in the startup of the system, participate in the field testing of the system, and place the system in trouble-free operation. Provide 8 hours of in class training and 8 hours of hands on training.

3.6 SERVICE CONTRACT

A. Include a service contract for 5 years from substantial completion to maintain the system and provide hardware and software updates during this period. Include parts, labor and travel expenses in the proposed service contract.

END OF SECTION

SECTION 23 11 23

FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Manual gas shutoff valves.
5. Pressure regulators.
6. Dielectric fittings.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 26 32 13 – Gas Engine Driven Generator Sets

1.2 REFERENCES

A. Codes and Standard referred to in this Section are:

1. NFPA 54 - National Fuel Gas Code

2. AGA - American Gas Association

3. NFPA-70 - National Electrical Code

4. ASTM D 2385 - Test Method for Hydrogen Sulfide and Mercaptan Sulfur in Natural Gas

5. ASTM D 2420 - Test Method for Hydrogen Sulfide in Liquified Petroleum Gases

6. ASTM D 2513 - Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings

7. ASTM D 2517 - Specification for Reinforced Epoxy Resin Gas Pressure Pipe and Fittings

8. MSS SP 78 - Gray Iron Plug Valves, Flanged and Threaded Ends

9. ASTM D 1248 - Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

10. ASTM D 3350 - Specification for Polyethylene Plastics Pipe and Fittings Materials

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Dielectric fittings.

B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1. Shop Drawing Scale: 1/4 inch per foot.
2. Detail mounting, supports, and valve arrangements for pressure regulator assembly.

C. Coordination Drawings: Plans and details, drawn to scale, on which natural-gas piping is shown and coordinated with other installations, using input from installers of the items involved.

D. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.

E. Qualification Data: For qualified professional engineer.

F. Welding certificates.

G. Field quality-control reports.

H. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. 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.

D. NFPA 54 - National Fuel Gas Code, for gas piping materials and components, gas piping installations and inspection, testing, and purging of gas piping systems.

E. AGA - American Gas Association.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

D. Protect stored PE pipes and valves from direct sunlight.

1.7 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:

1. Notify Construction Manager or Owner no fewer than two days in advance of proposed interruption of natural-gas service.
2. Do not proceed with interruption of natural-gas service without Construction Manager's or Owner's written permission.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.

2. Service Regulators: 65 psig (450 kPa) minimum unless otherwise indicated.

2.2 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

    a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

6. Mechanical Couplings:

    a. Stainless-steel flanges and tube with epoxy finish.
    b. Buna-nitrile seals.
    c. Stainless-steel bolts, washers, and nuts.
    d. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
    e. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

2.3 PIPING SPECIALTIES

A. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.

2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.4 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.5 MANUAL GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

C. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Body: Bronze, complying with ASTM B 584.
2. Ball: Chrome-plated bronze.
3. Stem: Bronze; blowout proof.
4. Seats: Reinforced TFE; blowout proof.
5. Packing: Threaded-body packnut design with adjustable-stem packing.
6. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. CWP Rating: 600 psig.
8. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Bronze Plug Valves: MSS SP-78.

1. Body: Bronze, complying with ASTM B 584.
2. Plug: Bronze.
3. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Operator: Square head or lug type with tamperproof feature where indicated.
5. Pressure Class: 125 psig.
6. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
7. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.

1. Body: Cast iron, complying with ASTM A 126, Class B.
2. Plug: Bronze or nickel-plated cast iron.
3. Seat: Coated with thermoplastic.
4. Stem Seal: Compatible with natural gas.
5. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
6. Operator: Square head or lug type with tamperproof feature where indicated.
7. Pressure Class: 125 psig.
8. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Body: Cast iron, complying with ASTM A 126, Class B.
2. Plug: Bronze or nickel-plated cast iron.
3. Seat: Coated with thermoplastic.
4. Stem Seal: Compatible with natural gas.
5. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
6. Operator: Square head or lug type with tamperproof feature where indicated.
7. Pressure Class: 125 psig.
8. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Body and Diaphragm Case: Cast iron or die-cast aluminum.
2. Springs: Zinc-plated steel; interchangeable.
3. Diaphragm Plate: Zinc-plated steel.
4. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
5. Orifice: Aluminum; interchangeable.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
8. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
9. Overpressure Protection Device: Factory mounted on pressure regulator.
10. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
11. Maximum Inlet Pressure: 2 psig.

2.7 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Description:

a. Standard: ASSE 1079.
b. Pressure Rating: 125 psig minimum at 180 deg F.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Description:

a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 125 psig minimum at 180 deg F.
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Description:

a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig.
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

2.8 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 and the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least 36 inches below finished grade.

1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

C. Install underground, PE, natural-gas piping according to ASTM D 2774.

D. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

E. Install fittings for changes in direction and branch connections.

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

    a. Exception: Tubing passing through partitions or walls does not require striker barriers.

5. Prohibited Locations:

    a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    b. Do not install natural-gas piping in solid walls or partitions.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

T. Do not use natural-gas piping as grounding electrode.

U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

V. Install pressure gage upstream and downstream from each line regulator.

W. Install sleeves for piping penetrations of walls, ceilings, and floors.

X. Install sleeve seals for piping penetrations of concrete walls and slabs.

Y. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install anode for metallic valves in underground PE piping.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.8 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 PAINTING

A. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel.
d. Color: as approved by Owner.

B. Paint exposed, interior metal piping, valves, regulators and piping specialties, except components, with factory-applied paint or protective coating.

1. Latex Over Alkyd Primer System: MPI INT 5.1Q.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex.

d. Color: as approved by Owner.

2. Alkyd System: MPI INT 5.1E.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd.
d. Color: as approved by Owner.

C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.11 OUTDOOR PIPING SCHEDULE

A. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

3.12 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 5 PSIG

A. Aboveground piping NPS 2 and smaller shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground piping NPS 2-1/2 and larger shall be the following:

1. Steel pipe with wrought-steel fittings and welded joints.

3.13 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 and larger shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Cast-iron, nonlubricated plug valve.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Fire-alarm wire and cable.
3. 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.

1.2 DEFINITIONS

A. PV: Photovoltaic.

B. RoHS: Restriction of Hazardous Substances.

C. VFC: Variable-frequency controller.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

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, provide products by one of the following:

1. Belden Inc.
2. Encore Wire Corporation.
3. General Cable Technologies Corporation.
4. Okonite Company (The).
5. Southwire Company.

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 NM: Comply with UL 83 and UL 719.
2. Type THHN and Type THWN-2: Comply with UL 83.
3. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
4. Type UF: Comply with UL 83 and UL 493.
5. Type XHHW-2: Comply with UL 44.

F. Shield:

1. Type TC-ER: Cable designed for use with VFCs, with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.

2.2 FIRE-ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Wire & Cable Inc.
2. CommScope, Inc.
3. Comtran Corporation.
4. Genesis Cable Products; Honeywell International, Inc.

5. West Penn Wire.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.

1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.
3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with red identifier stripe, NTRL listed for fire-alarm and cable tray installation, plenum rated.

2.3 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, provide products by one of the following:

1. 3M Electrical Products.
2. AFC Cable Systems; a part of Atkore International.
3. Gardner Bender.
4. Hubbell Power Systems, Inc.
5. O-Z/Gedney; a brand of Emerson Industrial Automation.
6. Thomas & Betts Corporation; A Member of the ABB Group.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. 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: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

C. VFC Output Circuits Cable: Extra-flexible stranded for all sizes.

D. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Exposed Exterior Feeders: Type XHHW-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. 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.

C. 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.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 INSTALLATION OF FIRE-ALARM WIRING

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal pathway.

1. Install plenum cable in environmental airspaces, including plenum ceilings.
2. Fire-alarm circuits and equipment control wiring associated with fire-alarm system shall be installed in a dedicated pathway system. This system shall not be used for any other wire or cable.

C. Wiring Method:

1. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.
2. Fire-Rated Cables: Use of two-hour, fire-rated fire-alarm cables, NFPA 70, Types MI and CI, is not permitted.
3. Signaling Line Circuits: Power-limited fire-alarm cables shall not be installed in the same cable or pathway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes; cabinets; or equipment enclosures where circuit connections are made.

F. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.

G. Risers: Install at least two vertical cable risers to serve the fire-alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent receipt or transmission of signals from other floors or zones.

H. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the fire-alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.5 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.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.6 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.

3.7 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."

3.8 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."

3.9 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.

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.

C. Cables will be considered defective if they do not pass tests and inspections.

D. 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

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Foundation steel electrodes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Ground rods.
2. Ground rings.
3. Grounding arrangements and connections for separately derived systems.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding 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. Plans showing as-built, dimensioned locations of system described in "Field Quality Control" Article, including the following:

1) Ground rods.
2) Ground rings.
3) Grounding arrangements and connections for separately derived systems.

b. Instructions for periodic testing and inspection of grounding features at ground rings based on NFPA 70B.

1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
2) Include recommended testing intervals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

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 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Harger Lightning & Grounding.
5. Thomas & Betts Corporation; A Member of the ABB Group.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Tinned Conductors: ASTM B33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 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. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

I. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

J. Straps: Solid copper, copper lugs. Rated for 600 A.

K. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

L. Water Pipe Clamps:

1. Mechanical type, two pieces with zinc-plated bolts.

   a. Material: Die-cast zinc alloy.
   b. Listed for direct burial.

2. U-bolt type with malleable-iron clamp and copper ground connector.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).

B. Ground Plates: 1/4 inch (6 mm) thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.

1. Bury at least 30 inches (750 mm) below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

C. Grounding Conductors: Green-colored insulation with continuous yellow stripe.

D. Isolated Grounding Conductors: Green-colored insulation with more than one continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

E. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

F. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

C. 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.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

G. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

H. Metallic Fences: Comply with requirements of IEEE C2.

1. Grounding Conductor: Bare, tinned copper, not less than No. 8 AWG.
2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.6 FENCE GROUNDING

A. Fence Grounding: Install at maximum intervals of 1500 feet (450 m) except as follows:

1. Fences within 100 Feet (30 m) of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet (225 m).

a. Gates and Other Fence Openings: Ground fence on each side of opening.

1) Bond metal gates to gate posts.
2) Bond across openings, with and without gates, except at openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches (460 mm) below finished grade.

B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet (45 m) on each side of crossing.

C. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.

D. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches (150 mm) below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at grounding location.

E. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

3.7 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. Use exothermic welds for all below-grade connections.
3. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.

1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.

1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches (600 mm) from building's foundation.

I. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.8 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 tests and inspections.

D. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.

a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural

drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

E. Grounding system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.

H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Aluminum slotted support systems.
3. Conduit and cable support devices.
4. Support for conductors in vertical conduit.
5. Structural steel for fabricated supports and restraints.
6. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
7. Fabricated metal equipment support assemblies.

1.2 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.

C. Delegated-Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Ductwork, piping, fittings, and supports.
3. Structural members to which hangers and supports will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

a. Luminaires.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Projectors.

B. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

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. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-(10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit; a part of Atkore International.
    b. B-line, an Eaton business.
    c. ERICO International Corporation.
    d. Thomas & Betts Corporation; A Member of the ABB Group.
    e. Unistrut; Part of 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 criteria.
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cooper Industries, Inc.
    b. Thomas & Betts Corporation; A Member of the ABB Group.
    c. Unistrut; Part of Atkore International.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Channel Material: 6063-T5 aluminum alloy.
4. Fittings and Accessories Material: 5052-H32 aluminum alloy.
5. Channel Width: Selected for applicable load criteria.
6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hilti, Inc.
2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.

2. 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.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) B-line, an Eaton business.
2) Hilti, Inc.
3) ITW Ramset/Red Head; Illinois Tool Works, Inc.
4) MKT Fastening, LLC.

3. 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.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M,Grade A325 (Grade A325M).
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

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
3. NECA 102.
4. NECA 105.
5. NECA 111.

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 EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

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, EMT, IMC and 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 (90 kg).

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 Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. 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. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. 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 (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

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.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 260529

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for firestopping at conduit and box entrances.

1.02 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.03 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.04 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
3. Contractor shall utilize computer generated BIM model for coordination purpose.

B. Qualification Data: For professional engineer.

C. Source quality-control reports.

PART 2 - PRODUCTS

2.01 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AFC Cable Systems; a part of Atkore International.
    b. Allied Tube & Conduit; a part of Atkore International.
    c. Anamet Electrical, Inc.
    d. Calconduit.
    e. FSR Inc.
    f. O-Z/Gedney; a brand of Emerson Industrial Automation.

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. GRC: Comply with ANSI C80.1 and UL 6.
4. ARC: Comply with ANSI C80.5 and UL 6A.
5. IMC: Comply with ANSI C80.6 and UL 1242.
6. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

    a. Comply with NEMA RN 1.
    b. Coating Thickness: 0.040 inch (1 mm), minimum.

7. EMT: Comply with ANSI C80.3 and UL 797.
8. FMC: Comply with UL 1; zinc-coated steel.
9. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AFC Cable Systems; a part of Atkore International.
    b. Allied Tube & Conduit; a part of Atkore International.
    c. Anamet Electrical, Inc.
    d. Calconduit.
    e. FSR Inc.
    f. O-Z/Gedney; a brand of Emerson Industrial Automation.

2. Comply with NEMA FB 1 and UL 514B.
3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

4. Fittings, General: Listed and labeled for type of conduit, location, and use.
5. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
6. Fittings for EMT:

    a. Material: Steel.
    b. Type: compression.

7. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
8. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC, or ARC: 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.

2.02 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AFC Cable Systems; a part of Atkore International.
    b. Anamet Electrical, Inc.
    c. Arnco Corporation.
    d. RACO; Hubbell.
    e. Thomas & Betts Corporation; A Member of the ABB Group.

2. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fiberglass:

    a. Comply with NEMA TC 14.
    b. Comply with UL 2515 for aboveground raceways.
    c. Comply with UL 2420 for belowground raceways.

4. ENT: Comply with NEMA TC 13 and UL 1653.
5. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
6. LFNC: Comply with UL 1660.
7. Rigid HDPE: Comply with UL 651A.
8. Continuous HDPE: Comply with UL 651A.
9. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D3485.
10. RTRC: Comply with UL 2515A and NEMA TC 14.

B. Nonmetallic Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AFC Cable Systems; a part of Atkore International.
   b. Anamet Electrical, Inc.
   c. Arnco Corporation.
   d. RACO; Hubbell.
   e. Thomas & Betts Corporation; A Member of the ABB Group.

2. Fittings, General: Listed and labeled for type of conduit, location, and use.
3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

   a. Fittings for LFNC: Comply with UL 514B.

4. Solvents and Adhesives: As recommended by conduit manufacturer.

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-line, an Eaton business.
2. Hoffman; a brand of Pentair Equipment Protection.
3. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.04 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Crouse-Hinds, an Eaton business.
2. EGS/Appleton Electric.
3. Hoffman; a brand of Pentair Equipment Protection.

4. Hubbell Incorporated.
5. O-Z/Gedney; a brand of Emerson Industrial Automation.

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. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Semi-adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

K. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box 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.

2.05 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armorcast Products Company.
    b. NewBasis.
    c. Oldcastle Precast, Inc.
    d. Quazite: Hubbell Power Systems, Inc.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC.".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.06 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not subject to severe physical damage: IMC.
2. Concealed Conduit, Aboveground: IMC.
3. Underground Conduit: Type EPC-40-PVC concrete encased.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: IMC. Raceway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Gymnasiums.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate 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. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.02 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. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.

D. Do not fasten conduits onto the bottom side of a metal deck roof.

E. Keep raceways at least 6 inches (150 mm) 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 except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) 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. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches (300 mm) of enclosures to which attached.

L. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.

4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to GRC or IMC before rising above floor.

M. Stub-Ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

N. 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.

O. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

Q. 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 (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

R. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

S. 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.

T. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

U. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

V. Surface Raceways:

1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

W. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

X. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Conduit extending from interior to exterior of building.
4. Conduit extending into pressurized duct and equipment.
5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
6. Where otherwise required by NFPA 70.

Y. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

Z. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
    d. Attics: 135 deg F (75 deg C) temperature change.
    e. <Insert location and corresponding temperature change>.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

AA. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

BB. 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.

CC. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

DD. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

EE. Locate boxes so that cover or plate will not span different building finishes.

FF. 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.

GG. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

HH. Set metal floor boxes level and flush with finished floor surface.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of

60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits but a minimum of 6 inches (150 mm) below grade. Align planks along centerline of conduit.
7. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install handholes with bottom below frost line.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install 0sleeves 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."

3.06 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.07 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

SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 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.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A53/A53M, 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 (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D1785, 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 (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

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: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating 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.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. HOLDRITE.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

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. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. 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. Comply with requirements in Section 079200 "Joint Sealants."
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 (6.4-mm) 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.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. 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.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using [steel] [cast-iron] pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) 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

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 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.

1.2 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. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. 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.

D. Delegated-Design Submittal: For arc-flash hazard study.

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. Comply with NFPA 70E requirements for arc-flash warning labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

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 and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.

4. Color for Neutral: White.
5. Color for Equipment Grounds: Green.
6. Colors for Isolated Grounds: Green with two or more yellow stripes.

C. Raceways and Cables Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

D. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

E. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

F. Equipment Identification Labels:

1. Black letters on a white field.

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.

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.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

1. 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.
2. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameters and that stay in place by gripping action.

B. 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 (93 deg C). Comply with UL 224.

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.

C. Tape and Stencil: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers placed diagonally over orange background and are 12 inches (300 mm) wide. Stop stripes at legends.

D. Floor Marking Tape: 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

E. Underground-Line Warning Tape:

1. Tape:

   a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical [and communications]utility lines.
   b. Printing on tape shall be permanent and shall not be damaged by burial operations.
   c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

   a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
   b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
   c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.6 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.023 inch (0.58 mm) 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 (0.38 mm) 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. Baked-Enamel Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches (180 by 250 mm).

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch (1-mm) galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches (250 by 360 mm).

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

    a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
    b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
    c. Engraved legend with black letters on white face.
    d. Punched or drilled for mechanical fasteners with 1/4-inch (6.4-mm) grommets in corners for mounting.
    e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

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. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

L. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

M. 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.

N. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

O. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

P. 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- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

Q. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

R. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

S. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

T. 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 (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

U. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

V. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

W. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench [or concrete envelope]exceeds 16 inches (400 mm) overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

X. Baked-Enamel 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- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

Y. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

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. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil. Stencil legend "DANGER - CONCEALED HIGH-VOLTAGE WIRING" with 3-inch- (75-mm-) high, black letters on 20-inch (500-mm) centers.

1. Locate identification at changes in direction, at penetrations of walls and floors, and at 30-foot (10-m) maximum intervals.

D. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Snap-around color-coding bands for raceway and cables.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

E. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

F. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. 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.

H. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

I. Concealed Raceways and Duct Banks, More Than 600 V, within Buildings: Apply floor marking tape to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches (300 mm) of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

J. 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.

K. Arc Flash Warning Labeling: Self-adhesive labels.

L. Operating Instruction Signs: Self-adhesive labels.

M. Emergency Operating Instruction Signs: Laminated acrylic or melamine plastic signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

N. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign.
3. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Switchboards.
    e. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    f. Emergency system boxes and enclosures.
    g. Enclosed switches.
    h. Enclosed circuit breakers.
    i. Enclosed controllers.
    j. Variable-speed controllers.
    k. Push-button stations.
    l. Contactors.
    m. Remote-controlled switches, dimmer modules, and control devices.
    n. Monitoring and control equipment.
    o. UPS equipment.

END OF SECTION

SECTION 26 05 73

ARC-FLASH HAZARD ANALYSIS

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 a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals **shall** be in digital form:

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.
3. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Provide maintenance procedures in equipment manuals according to requirements in NFPA 70E.
2. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

D. Power System Analysis Software Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Computer program shall be designed to perform arc-flash analysis or have a function, component, or add-on module designed to perform arc-flash analysis.
2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

E. Power Systems Analysis Specialist Qualifications: Professional engineer in charge of performing the arc-flash study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

F. Arc-Flash Study Certification: Arc-Flash Study Report shall be signed and sealed by Power Systems Analysis Specialist.

G. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CGI CYME.
2. EDSA Micro Corporation.
3. ESA Inc.
4. Operation Technology, Inc.
5. Power Analytics, Corporation.
6. SKM Systems Analysis, Inc.

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output Data: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."

F. Protective Device Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."

G. Arc-Flash Study Output Reports:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Restricted approach boundary.
6. Limited approach boundary.
7. Working distance.
8. Incident energy.
9. Hazard risk category.
10. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch (76-by-127-mm) self-adhesive equipment label for each work location included in the analysis.

B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Protection boundaries.
    a. Arc-flash boundary.
    b. Restricted approach boundary.
    c. Limited approach boundary.
4. Arc flash PPE category.
5. Required minimum arc rating of PPE in Cal/cm squared.
6. Available incident energy.
7. Working distance.
8. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies: Perform the Short-Circuit and Protective Device Coordination studies prior to starting the Arc-Flash Hazard Analysis.

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."
2. Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."

C. Calculate maximum and minimum contributions of fault-current size.

1. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
2. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.
3. Calculate arc-flash energy at 38 percent of maximum short-circuit current according to NFPA 70E recommendations.
4. Calculate arc-flash energy with the utility contribution at a minimum and assume no motor contribution.

D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.

F. Calculate the limited, restricted, and prohibited approach boundaries for each location.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article.
2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.

3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance or available short circuit current at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
15. Medium-voltage conductor sizes, lengths, conductor material, conductor construction and metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).

3.4 LABELING

A. Apply arc-flash label on the front cover of each section of the equipment for each equipment included in the study. Base arc-flash label data on highest values calculated at each location.

B. Each piece of equipment listed below shall have an arc-flash label applied to it:
1. Low-voltage switchboard.
2. Low voltage transformers.
3. Panelboard and safety switch over 250 V.
4. Applicable panelboard and safety switch under 250 V.
5. Control panel.

6. Generator related panelboards and control panels.

C. Note on record Drawings the location of equipment where the personnel could be exposed to arc-flash hazard during their work.

1. Indicate arc-flash energy.
2. Indicate protection level required.

3.5 APPLICATION OF WARNING LABELS

A. Install arc-flash warning labels under the direct supervision and control of Power System Analysis Specialist.

3.6 DEMONSTRATION

A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in potential arc-flash hazards associated with working on energized equipment and the significance of arc-flash warning labels.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Load centers.
4. Electronic-grade panelboards.

1.2 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. HID: High-intensity discharge.

E. MCCB: Molded-case circuit breaker.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.

5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Include evidence of NRTL listing for SPD as installed in panelboard.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include wiring diagrams for power, signal, and control wiring.
10. Key interlock scheme drawing and sequence of operations.
11. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Panelboard Schedules: For installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.
3. Test result for EM circuit breakers selective coordination study.

1.6 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. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and GFEP Types: Two spares for each panelboard.
3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.9 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding minus 22 deg F to plus 104 deg F.
    b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

C. 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 Architect no fewer than two days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Owner's written permission.
3. Comply with NFPA 70E.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.

1. SPD Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. 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.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

    a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    b. Outdoor Locations: NEMA 250, Type 3R.
    c. Kitchen Wash-Down Areas: NEMA 250, Type 4X.
    d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
    e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

2. Height: 84 inches maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
7. Finishes:

    a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Galvanized steel.
    c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

G. Incoming Mains:

1. Location: Convertible between top and bottom.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

H. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

    a. Plating shall run entire length of bus.
    b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
6. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and listed and labeled by an NRTL acceptable to authority having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on Drawings. Connectors shall be sized for double-sized or parallel conductors as indicated on Drawings. Do not mount neutral bus in gutter.
7. Split Bus: Vertical buses divided into individual vertical sections.

I. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
8. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.
9. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

J. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

K. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: Five percent.

L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 22,000 A rms symmetrical.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 42,000 A rms symmetrical.

2.2 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.3 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. Panelboards: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Circuit breaker, Fused switch, Lugs only.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker, lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

F. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:

a. RMS sensing.
b. Field-replaceable rating plug or electronic trip.
c. Digital display of settings, trip targets, and indicated metering displays.
d. Multi-button keypad to access programmable functions and monitored data.
e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
f. Integral test jack for connection to portable test set or laptop computer.
g. Field-Adjustable Settings:

1) Instantaneous trip.
2) Long- and short-time pickup levels.
3) Long and short time adjustments.
4) Ground-fault pickup level, time delay, and I squared T response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
6. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
7. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
g. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
h. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
i. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
j. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."
2. Fused Switch Features and Accessories:

a. Standard ampere ratings and number of poles.
b. Mechanical cover interlock with a manual interlock override, to prevent the opening of the cover when the switch is in the on position. The interlock shall prevent the switch from being turned on with the cover open. The operating handle shall have lock-off means with provisions for three padlocks.

2.6 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces.

Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NEMA PB 1.1.

D. Equipment Mounting:

1. Install panelboards on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in manufacturer's requirement.
2. Attach panelboard to the vertical finished or structural surface behind the panelboard.
3. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Mount top of trim 90 inches above finished floor unless otherwise indicated.

G. Mount panelboard cabinet plumb and rigid without distortion of box.

H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

I. Mount surface-mounted panelboards to steel slotted supports 1 1/4 inch in depth. Orient steel slotted supports vertically.

J. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.
2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

K. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

L. Install filler plates in unused spaces.

M. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

N. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

O. Mount spare fuse cabinet in accessible location.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.

c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

E. Panelboards will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges per manufacturer's coordination Studies

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.

1. Measure loads during period of normal facility operations.
2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Receptacle switches.
4. Shunt trip switches.
5. Molded-case circuit breakers (MCCBs).
6. Molded-case switches.
7. Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, 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 for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Data: Certificates, for enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers 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. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
b. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

1.6 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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.8 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.

1.9 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(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.2 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. Type HD, Heavy Duty:

1. Double throw.
2. Three pole.
3. 600-V ac.
4. 1200 A and smaller.

5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

2.3 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. Type GD, General Duty, Three Pole, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. 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.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: mechancial type, suitable for number, size, and conductor material.
7. Service-Rated Switches: Labeled for use as service equipment.

2.4 RECEPTACLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: 600-V ac, UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate indicated fuses;

lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

C. Interlocking Linkage: Provided between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.

D. Receptacle: Polarized, three-phase, four-wire receptacle (fourth wire connected to enclosure ground lug).

2.5 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations.

E. MCCBs shall be equipped with a device for locking in the isolated position.

F. Lugs shall be suitable for 140 deg F rated wire on 125-A circuit breakers and below, 194 deg F rated wire, sized according to the 167 deg F temperature rating in NFPA 70.

G. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.

H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I-squared t response.

K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

L. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

M. Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

N. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

O. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; [integrally mounted, self-powered] [remote-mounted and powered] type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
8. Zone-Selective Interlocking: Integral with [electronic] [ground-fault] trip unit; for interlocking ground-fault protection function.
9. Electrical Operator: Provide remote control for on, off, and reset operations.

2.6 MOLDED-CASE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.

2. General Electric Company.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. Description: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

C. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.

D. Features and Accessories:

1. Standard frame sizes and number of poles.
2. Lugs:

   a. Mechanical type, suitable for number, size, trip ratings, and conductor material.
   b. Lugs shall be suitable for 140 deg F rated wire on 125-A circuit breakers and below. 194 deg F rated wire, sized according to the 167 deg F temperature rating in NFPA 70.

3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
6. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
7. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
8. Electrical Operator: Provide remote control for on, off, and reset operations.

2.7 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 gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1), gray baked enamel paint, electrodeposited on cleaned, phosphatized galvannealed steel (NEMA 250 Types 3R, 12), a brush finish on Type 304 stainless steel (NEMA 250 Type 4-4X stainless steel), copper-free cast aluminum alloy (NEMA 250 Types 7, 9).

C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.

D. Operating Mechanism: 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 Type 4, 4X stainless steel, 12, or 12K 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.

F. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers 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 Construction Manager no fewer than [seven] <Insert number> 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 Construction Manager's written permission.
4. Comply with NFPA 70E.

3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

3.4 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, 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 and circuit breakers with tops at uniform height unless otherwise indicated.

C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in fusible devices.

F. 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. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.

E. 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. Verify that fuse sizes and types match the Specifications and Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. 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.

h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
i. Verify correct phase barrier installation.
j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
c. 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. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

F. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.
e. Operate the circuit breaker to ensure smooth operation.

f. 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.

g. Inspect operating mechanism, contacts, and chutes in unsealed units.
h. Perform adjustments for final protective device settings in accordance with the coordination study.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker 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.
c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
e. Determine the following by primary current injection:

1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.

3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.

f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
i. Verify operation of charging mechanism. Investigate units that do not function as designed.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

G. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

H. 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.

B. Set field-adjustable circuit-breaker trip ranges.

END OF SECTION 262816

SECTION 26 29 13

SOFT-START MOTOR CONTROLLERS

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 soft-start motor controllers that are designed for reduced-voltage start and full-voltage run duty.

1. Enclosed soft-start controllers.
2. Combination soft-start controllers.
3. Bypass motor controller.
4. Enclosures.
5. Accessories.
6. Identification.

1.3 DEFINITIONS

A. CPT: Control power transformer.

B. FLA: Full-load current.

C. MCCB: Molded-case circuit breaker.

D. MCP: Motor circuit protector.

E. NC: Normally closed.

F. NO: Normally open.

G. OCPD: Overcurrent protective device.

H. SCCR: Short-circuit current rating.

I. SCPD: Short-circuit protective device.

J. SCR: Silicon-controlled rectifier.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For each type of controller.

1. Include plans, elevations, sections, and mounting details.
2. Indicate dimensions, weights, required clearances, and location and size of each field connection.
3. Wire Termination Diagrams and Schedules: Include diagrams for signal and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.
4. Include features, characteristics, ratings, and factory settings of individual OCPD and auxiliary components.

C. Product Schedule: For each enclosed controller.

1. Each installed soft-start controller type.
2. NRTL listing.
3. Factory-installed accessories.
4. Nameplate legends.
5. SCCR of integrated unit.

a. For each combination soft-start controller, include features, characteristics, ratings, and factory setting of the SCPD and OCPD.

1) Listing document proving Type 2 coordination.

b. For each series-rated combination, state the listed integrated SCCR (withstand) of SCPDs and OCPDs by an NRTL acceptable to authorities having jurisdiction.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Seismic Qualification Data: Certificates, for soft-start controllers, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Source quality-control reports.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For soft-start controllers to include in operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Routine maintenance requirements for soft-start controllers and installed components.
b. Manufacturer's written instructions for testing and adjusting circuit-breaker and MCP trip settings.
c. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage soft-start controllers.
d. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate FLAs.
e. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.

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. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Two of each type and color installed.
4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store soft-start controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect soft-start controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover soft-start controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; connect factory-installed space heaters to temporary electrical service.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than 32 deg F and not exceeding 104 deg F, humidity noncondensing.
2. Altitude: Not exceeding 3300 feet.
3. The effect of solar radiation is insignificant.

PART 2 - PRODUCTS

2.1 MOTOR CONTROLLER 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 use.

B. UL Compliance: Fabricate and label enclosed controllers to comply with UL 508.

C. NEMA Compliance: Fabricate motor controllers to comply with NEMA ICS 2.

2.2 ENCLOSED SOFT-START MOTOR CONTROLLERS

A. Description: Controllers designed for reduced-voltage start, full-voltage run, and optional soft stop. The controller shall be an integrated unit with power SCRs, heat sink, microprocessor logic board, door-mounted digital display and user interface module, run-bypass contactor, and overload relay(s); suitable for use with NEMA MG 1, Design B, polyphase, medium induction motors.

1. Run-Bypass Contactor: Magnetic contactor in parallel with the SCR of the soft-start controller, bypassing the SCR when full voltage is achieved.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.

3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

C. Standard: Comply with NEMA ICS 2, general purpose, Class A.

D. Configuration: Standard duty.

1. At least two SCRs per phase to control the starting and stopping of the motor.
2. Microprocessor control shall continuously monitor current and proper operation of the SCRs.
3. Bypass Contactor: Operates automatically when full voltage is applied to motor, and bypasses the SCRs. Soft-start controller protective features and deceleration controls shall remain active when this contactor is in the bypass mode.
4. Power Electronics Disconnect Contactor. Where indicated, installed ahead of the power electronics equipment, and shall open automatically when the motor is stopped, or a controller fault is detected, or when an SCR shorts.
5. Logic Board: Identical for all ampere ratings and voltage classes, with environmental protective coating.
6. Surge Protection: Comply with NEMA ICS 2 requirements for surge suppression.

E. Control Power:

1. For on-board control power, obtain from line circuit or from integral CPT. The CPT shall have capacity to operate integral devices and remotely located pilot, indicating, and control devices.
2. Spare CPT Capacity: As indicated on Drawings, available in increments of 100 VA, from 100 to 500 VA.

F. Controller Diagnostics and Protection:

1. Microprocessor-based thermal-protection system for monitoring SCR and motor thermal characteristics, and providing controller overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
2. Protection from line-side reverse phasing; line-side and motor-side phase loss; motor jam, stall, and under-load conditions; and line frequency over or under normal.
3. Input isolation contactor that opens when the controller diagnostics detect a faulted soft-start component or when the motor is stopped.

G. Cover mounted-controller status panel with LED lights or alphanumeric display to show the following:

1. Starter Status: "Ready," "starting," "stopping," or "run."
2. Motor current in amperes.
3. Faults:

    a. Motor overcurrent trip.
    b. Motor thermal overload.
    c. Starter thermal fault.
    d. Low line voltage.
    e. Loss of a phase.
    f. Phases reversed.

g. Maximum stating time exceeded.
h. Serial communications error.

H. Interface Panel:

1. Guarded adjustable set points, not readily accessible.

a. Motor FLA, adjustable from 40 to 110 percent of the controller's rating.
b. Current limitation on starting, adjustable from 200 to 500 percent of FLA, typically set at 300 percent.
c. NEMA ICS 2 overload class. Selections shall include the following tripping classes: Class 5, Class 10, Class 15, Class 20, and Class 30.

2. Adjustable set points, readily accessible.

a. Linear acceleration, adjustable from 1 to 60 s
b. Maximum start time, adjustable from 1 to 250 s
c. Selector switch; select coast to stop or soft stop.
d. Linear deceleration, adjustable from 1 to 60 s.

I. Remote Output Features. All outputs shall be prewired to terminal blocks.

1. Analog output for field-selectable assignment of motor operating characteristics; [0- to 10-V dc] [4- to 20-mA dc].
2. Form C status contacts that change state when controller is running.
3. Form C alarm contacts that change state when a fault condition occurs.

2.3 COMBINATION SOFT-START MOTOR CONTROLLERS

A. Description: Factory-assembled, combination, reduced-voltage soft-start controller with a disconnecting means, SCPD and OCPD, in a single enclosure. The reduced-voltage soft-start controller shall consist of an integrated unit with power SCRs, heat sink, microprocessor logic board, door-mounted digital display and user interface module, run-bypass contactor, and overload relay(s); suitable for use with NEMA MG 1, Design B, polyphase, medium induction motors.

1. Run-Bypass Contactor: Magnetic contactor in parallel with the SCR of the soft-start controller, bypassing the SCR when full voltage is achieved.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

C. Standard: Comply with NEMA ICS 2, general purpose, Class A.

D. Configuration: Standard duty.

1. At least two SCRs per phase to control the starting and stopping of the motor.
2. Microprocessor control shall continuously monitor current and proper operation of the SCRs.
3. Bypass Contactor: Operates automatically when full voltage is applied to motor, and bypasses the SCRs. Soft-start controller protective features and deceleration controls shall remain active when this contactor is in the bypass mode.
4. Power Electronics Disconnect Contactor. Where indicated, installed ahead of the power electronics equipment, and shall open automatically when the motor is stopped, or a controller fault is detected, or when an SCR shorts.
5. Logic Board: Identical for all ampere ratings and voltage classes, with environmental protective coating.
6. Surge Protection: Comply with NEMA ICS 2 requirements for surge suppression.

E. Control Power:

1. For on-board control power, obtain from line circuit or from integral CPT. The CPT shall have capacity to operate integral devices and remotely located pilot, indicating, and control devices.
2. Spare CPT Capacity: As indicated on Drawings, available in increments of 100 VA, from 100 to 500 VA.

F. Controller Diagnostics and Protection:

1. Microprocessor-based thermal-protection system for monitoring SCR and motor thermal characteristics, and providing controller overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
2. Protection from line-side reverse phasing; line-side and motor-side phase loss; motor jam, stall, and under-load conditions; and line frequency over or under normal.
3. Input isolation contactor that opens when the controller diagnostics detect a faulted soft-start component or when the motor is stopped.

G. Cover mounted-controller status panel with LED lights or alphanumeric display to show the following:

1. Starter Status: "Ready," "starting," "stopping," or "run."
2. Motor current in amperes.
3. Faults:

    a. Motor overcurrent trip.
    b. Motor thermal overload.
    c. Starter thermal fault.
    d. Low line voltage.
    e. Loss of a phase.
    f. Phases reversed.
    g. Maximum stating time exceeded.
    h. Serial communications error.

H. Interface Panel:

1. Guarded adjustable set points, not readily accessible.

a. Motor FLA, adjustable from 40 to 110 s percent of the controller's rating.
b. Current limitation on starting, adjustable from 200 to 500 percent of FLA, typically set at 300 percent.
c. NEMA ICS 2 overload class. Selections shall include the following tripping classes: Class 5, Class 10, Class 15, Class 20, and Class 30.

2. Adjustable set points, readily accessible.

a. Linear acceleration, adjustable from 1 to 60 s.
b. Maximum start time, adjustable from 1 to 250 s.
c. Selector switch; select coast to stop or soft stop.
d. Linear deceleration, adjustable from 1 to 60 s.

I. Remote Output Features: All outputs shall be prewired to terminal blocks.

1. Analog output for field-selectable assignment of motor operating characteristics; 0- to 10-V dc.
2. Form C status contacts that change state when controller is running.
3. Form C alarm contacts that change state when a fault condition occurs.

J. Digital Communication Module: RS-485 Modbus, RTU protocol to transmit the following to the LAN:

1. Instantaneous rms current each phase, and three-phase average.
2. Voltage: L-L for each phase, L-L three-phase average, L-N each phase, and L-N three-phase average - rms.
3. Active Energy (kilowatt-hour): Three-phase total.
4. Power Factor: three-phase total.

K. Fusible Disconnecting Means:

1. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate [Class J] [Class L] [indicated] fuses.
2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
3. Auxiliary Contacts: NO or NC, arranged to activate before switch blades open.

L. MCP Disconnecting Means:

1. UL 489 and NEMA AB 3 (with interrupting capacity to comply with available fault currents) instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
3. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.

a. Current-limiting module to increase controller SCCR (withstand) to 100 kA.

M. MCCB Disconnecting Means:

1. UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.

2. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
3. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
4. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.

N. Molded-Case Switch Disconnecting Means:

1. UL 489 and NEMA AB 3, with in-line fuse block for Class J or Class L power fuses (depending on ampere rating), providing an interrupting capacity to comply with available fault currents; MCCB with fixed, high-set instantaneous trip only.
2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
3. Auxiliary contacts "a" and "b" arranged to activate with molded-case switch handle.

2.4 ENCLOSURES

A. Comply with NEMA 250, Type designations as indicated on Drawings, to comply with environmental conditions at installed location.

B. Construction of the enclosures shall comply with NEMA ICS 6.

C. Controllers in hazardous (classified) locations shall comply with UL 1203.

2.5 ACCESSORIES

A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Standard duty, except as needed to match enclosure type. Heavy-duty or oiltight where indicated in the controller schedule.

a. Push Buttons: As indicated in the controller schedule.
b. Pilot Lights: As indicated in the controller schedule.

2. Elapsed Time Meters: Heavy duty with digital readout in hours.
3. Meters: Panel type, 2-1/2-inch minimum size with 90- or 120-degree scale and plus or minus 2 percent accuracy. Where indicated, provide selector switches with an off position.

B. Space heaters, with NC auxiliary contacts, to mitigate condensation in Type 3R enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

C. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.

2.6 IDENTIFICATION

A. Controller Nameplates: Laminated acrylic or melamine plastic signs, as described in Section 260553 "Identification for Electrical Systems," for each compartment, mounted with corrosion-resistant screws.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and space conditions for compliance with requirements for motor controllers, their relationship with the motors, and other conditions affecting performance of the Work.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Wall-Mounted Controllers: Install controllers on walls with tops at uniform height indicated, and by bolting units to wall or mounting on slotted support systems complying with Section 260529 "Hangers and Supports for Electrical Systems," and bolted to wall.

C. Freestanding Controllers: Provide slotted support systems complying with Section 260529 "Hangers and Supports for Electrical Systems."

D. Floor-Mounted Controllers: Install controllers on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in manufacturer’s requirements.

E. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

F. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

G. Control Wiring: Separate control wiring from power wiring. Where unavoidable, use twisted pair cabling or shielded cables for control wiring.

H. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

I. Setting of Overload Relays: Select and set overloads on the basis of FLA rating as shown on motor nameplate. Adjust setting value for special motors as required by NFPA 70 for high-torque, high-efficiency, and so on motors.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.

E. Tests and Inspections:

1. Comply with provisions of NFPA 70B, Chapter "Testing and Test Methods."
2. Visual and Mechanical Inspection:

    a. Compare equipment nameplate data with Drawings and the Specifications.
    b. Inspect physical and mechanical condition.
    c. Inspect anchorage, alignment, and grounding.
    d. Verify that the unit is clean.
    e. Ensure that vent path openings are free from debris and that heat-transfer surfaces are clean.
    f. Verify correct connections of circuit boards, wiring, disconnects, and ribbon cables.
    g. Inspect Contactors:

        1) Verify mechanical operation.
        2) Verify that contact gap, wipe, alignment, and pressure are according to manufacturer's published data.

    h. Motor-Running Protection:

        1) Verify that motor FLA is at, or under, the controller current rating.
        2) Verify that overload element setting is correct for its application.
        3) Apply minimum- and maximum-speed set points. Verify that set points are within limitations of the load coupled to the motor.
        4) If motor-running protection is provided by fuses, verify correct fuse rating.

    i. Inspect bolted electrical connections for high resistance using one of the following two methods:

        1) Use a low-resistance ohmmeter. 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 according to manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.

j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

3. 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. Insulation-resistance values shall be according to manufacturer's published data or NETA ATS, Table 100.1. In the absence of manufacturer's published data, use Table 100.5. Values of insulation resistance less than this table or manufacturer's written instructions shall be investigated and corrected.
b. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
c. Test motor protection devices according to manufacturer's published data.
d. Test circuit breakers as follows:

1) Operate the circuit breaker to ensure smooth operation.
2) For adjustable circuit breakers, adjust protective device settings according to the coordination study. Comply with coordination study recommendations.

e. Test the electronic motor overload relay elements by injecting primary current through the overload circuit and monitoring trip time of the overload element.
f. Test the following parameters according to NETA relay calibration procedures, or as recommended by manufacturer:

1) ANSI No. 49R, Overtemperature Protection:

a) Determine time delay at 300 percent of setting.
b) Determine a second point on the operating curve.
c) Determine pickup.

2) ANSI No. 47, Input Phase Loss and Reversed Phases Protection:

a) Determine positive sequence voltage to close the NO contact.
b) Determine positive sequence voltage to open the NC contact (undervoltage trip).
c) Verify negative sequence trip.
d) Determine time delay to close the NO contact with sudden application of 120 percent of pickup.
e) Determine time delay to close the NC contact on removal of voltage when previously set to rated system voltage.

3) ANSI No. 81, Overfrequency Protection:

a) Verify frequency set points.

b) Determine time delay.
c) Determine undervoltage cutoff.

4) Fault Alarm Outputs: Verify that each relay contact performs its intended function in the control scheme including breaker trip tests, close inhibit tests, lockout tests, and alarm functions.

g. Perform operational tests by initiating control devices.

4. Infrared Inspection: Perform the survey during periods of maximum possible loading. Remove all necessary covers prior to the inspection.

a. Comply with recommendations of NFPA 70B, Chapter "Testing and Test Methods," Article "Infrared Inspection."
b. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of the electrical power connections of each motor controller.
c. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each motor controller 11 months after date of Substantial Completion.
d. Report of Infrared Inspection: Prepare a certified report that identifies the testing technician and equipment used, and lists the following results:

1) Description of equipment to be tested.
2) Discrepancies.
3) Temperature difference between the area of concern and the reference area.
4) Probable cause of temperature difference.
5) Areas inspected. Identify inaccessible and unobservable areas and equipment.
6) Identify load conditions at time of inspection.
7) Provide photographs and thermograms of the deficient area.
8) Recommended action.

e. Equipment: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1 deg C at 30 deg C. The equipment shall detect emitted radiation and convert detected radiation to a visual signal.
f. Act on inspection results, recommended action, and considering recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Owner's operations permit. Retest until deficiencies are corrected.

F. Motor controllers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

3.5 SYSTEM FUNCTION TESTS

A. System function tests shall prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality-control tests have been completed and all components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
3. Verify the correct operation of sensing devices, alarms, and indicating devices.

B. Motor controllers will be considered defective if they do not pass the system function tests and inspections.

C. Prepare test and inspection reports.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain motor controllers.

END OF SECTION 262913

SECTION 26 32 13

GAS-ENGINE-DRIVEN GENERATOR SETS

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. Engine.
2. Gas fuel system.
3. Control and monitoring.
4. Generator overcurrent and fault protection.
5. Generator, exciter, and voltage regulator.
6. Outdoor engine generator enclosure.
7. Vibration isolation devices.

B. Related Requirements:

1. Section 263600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.3 DEFINITIONS

A. EPS: Emergency power supply.

B. EPSS: Emergency power supply system.

C. LP: Liquefied petroleum.

D. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Include thermal damage curve for generator.
3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in cubic feet per hour (cubic meters per hour) at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
6. Include air flow requirements for cooling and combustion air in cfm at 0.8 power factor, with air supply temperature of 95 deg F (35 deg C), 80 deg F (27 deg C), 70 deg F (21 deg C), and 50 deg F (10 deg C). Provide drawings showing requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified.
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. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Source Quality-Control Reports: Including, but not limited to, the following:

1. Certified summary of prototype-unit test report.

2. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
3. Report of sound generation.
4. Report of exhaust emissions showing compliance with applicable regulations.

5. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

C. Field quality-control reports.

D. Warranty: For special warranty. 5 years.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For engine generators 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. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
b. Operating instructions laminated and mounted adjacent to generator location.
c. Training plan.

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. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
4. Tools: Each tool listed by part number in operations and maintenance manual.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.
2. Maintenance Service Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. MTU Onsite Energy Corporation (Basis of Design).
2. Caterpillar, Inc.; Electric Power Division.
3. Cummins Power Generation.
4. Kohler Power Systems.

B. Source Limitations: Obtain packaged engine generators and auxiliary components through one source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. B11 Compliance: Comply with B11.19.

B. NFPA Compliance:

1. Comply with NFPA 37.
2. Comply with NFPA 70.
3. Comply with NFPA 99.
4. Comply with NFPA 110.

C. UL Compliance: Comply with UL 2200.

D. Engine Exhaust Emissions: Comply with EPA Tier 2 requirements and applicable state and local government requirements.

E. Noise Emission: Comply with applicable state and local government requirements. **65DBA** for maximum noise level at 7 meters from generator set due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

F. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 5 to 104 deg F (Minus 15 to plus 40 deg C).
2. Relative Humidity: Zero to 95 percent.
3. Altitude: Sea level to 1000 feet (300 m).

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and use.

C. Power Rating: Standby.

D. Overload Capacity: 110 percent of service load for 1 hour in 12 consecutive hours.

E. EPSS Class: Engine generator shall be classified as Class 2 according to NFPA 110.

F. Service Load: 40 kW.

G. Power Factor: 0.8, lagging.

H. Frequency: 60 Hz.

I. Voltage: 120/208 V ac.

J. Phase: Three-phase, four wire, wye.

K. Governor: Adjustable isochronous, with speed sensing.

L. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

M. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.
2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

N. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.

4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time:
    a. Comply with NFPA 110, Type 10 system requirements.

    b. 10 seconds.

2.4 GAS ENGINE

A. Fuel: Natural gas.

B. Rated Engine Speed: 1800 rpm.

C. Lubrication System: Engine or skid-mounted.

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499 and with NFPA 110 requirements for Level 1 equipment for heater capacity.

E. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.

4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

    a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
    b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer:

1. Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

    a. Minimum sound attenuation of 25 dB at 500 Hz.
    b. Sound level measured at a distance of 25 feet (8 m) from exhaust discharge after installation is complete shall be 70 dBA or less.

G. Air-Intake Filter: Standard-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Starting System: 12 or 24-V electric, with negative ground.

1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.

    1. Cranking Cycle: As required by NFPA 110 for system level specified.

    2. Battery: Nickel cadmium, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least twice without recharging.

    3. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F (10 deg C) regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
4. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 A minimum continuous rating.

    6. Battery Charger: Current-limiting, automatic-equalizing and float-charging type designed for nickel cadmium batteries. Unit shall comply with UL 1236 and include the following features:

a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F (minus 40 deg C) to 140 deg F (plus 60 deg C) to prevent overcharging at high temperatures and undercharging at low temperatures.
c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.

e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 GAS FUEL SYSTEM

A. Natural Gas Piping: Comply with requirements in Section 231123 "Facility Natural Gas Piping."

B. Engine Fuel System:

C. Natural Gas, Vapor-Withdrawal System:

1. Carburetor.

2. Secondary Gas Regulators: One for each fuel type, with atmospheric vents piped to building exterior.
3. Fuel-Shutoff Solenoid Valves: NRTL-listed, normally closed, safety shutoff valves; one for each fuel source.
4. Fuel Filters: One for each fuel type.
5. Manual Fuel Shutoff Valves: One for each fuel type.
6. Flexible Fuel Connectors: Minimum one for each fuel connection.
7. LP gas flow adjusting valve.
8. Fuel change gas pressure switch.

2.6 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates generator-set shutdown. When engine generator is running, specified

system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts engine generator. The off position of same switch initiates generator-set shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

C. Provide minimum run time control set for 15 minutes with override only by operation of a remote emergency-stop switch.

D. Comply with UL 508A.

E. Configuration:

1. Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from generator-set vibration. Panel shall be powered from the engine generator battery.

F. Control and Monitoring Panel:

1. Digital controller with integrated LCD, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
2. Analog control panel with dedicated gages and indicator lights for the instruments and alarms indicated below.
3. Instruments: Located on the control and monitoring panel and viewable during operation.

    a. Engine lubricating-oil pressure gage.
    b. Engine-coolant temperature gage.
    c. DC voltmeter (alternator battery charging).
    d. Running-time meter.
    e. AC voltmeter, for each phase.
    f. AC ammeter, for each phase.
    g. AC frequency meter.
    h. Generator-voltage adjusting rheostat.

4. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm indication, including the following:

    a. Cranking control equipment.
    b. Run-Off-Auto switch.
    c. Control switch not in automatic position alarm.
    d. Overcrank alarm.
    e. Overcrank shutdown device.
    f. Low water temperature alarm.
    g. High engine temperature prealarm.
    h. High engine temperature.
    i. High engine temperature shutdown device.
    j. Overspeed alarm.
    k. Overspeed shutdown device.

l. Low fuel main tank.

1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for the duration required for the indicated EPSS class.

m. Coolant low-level alarm.

n. Coolant low-level shutdown device.

o. Coolant high-temperature alarm.
p. Coolant low-temperature alarm.
q. Coolant high-temperature shutdown device.
r. EPS supplying load indicator.

s. Battery high-voltage alarm.
t. Low cranking voltage alarm.
u. Battery-charger malfunction alarm.
v. Battery low-voltage alarm.
w. Contacts for local and remote common alarm.
x. Low-starting air pressure alarm.
y. Low-starting hydraulic pressure alarm.
z. Remote manual stop shutdown device.
aa. Air shutdown damper alarm when used.
bb. Air shutdown damper shutdown device when used.
cc. Hours of operation.
dd. Engine generator metering, including voltage, current, Hz, kW, kVA, and power factor.

ee. Generator overcurrent protective device not closed alarm.

G. Connection to Datalink:

1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.
2. Provide connections for datalink transmission of indications to remote data terminals via university's standard.

H. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.

I. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
2. Coolant low-temperature alarm.

3. High engine temperature prealarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel main tank alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Contacts for local and remote common alarm.
11. Audible-alarm silencing switch.
12. Air shutdown damper when used.
13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.
15. Low cranking voltage alarm.
16. Generator overcurrent protective device not closed.

J. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

K. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.

1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.

B. Generator Overcurrent Protective Device:

1. Molded-case circuit breaker, electronic-trip type; 100 percent rated; complying with UL 489:

a. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
b. Trip Settings: Selected to coordinate with generator thermal damage curve.
c. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
d. Mounting: Adjacent to or integrated with control and monitoring panel.

C. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.
2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

D. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.

1. Indicate ground fault with other engine generator alarm indications.
2. Trip generator protective device on ground fault.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six lead alternator.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Enclosure: Dripproof.

G. Instrument Transformers: Mounted within generator enclosure.

H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.

1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.

I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

2.9 OUTDOOR ENGINE GENERATOR ENCLOSURE

A. Description: Vandal-resistant, sound-attenuating, weatherproof steel housing, wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

1. Sound Attenuation Level: Level III, 62dBA at 7 meters from generator

B. Description: Prefabricated or pre-engineered, galvanized-steel-clad, integral structural-steel-framed, walk-in enclosure, erected on concrete foundation.

C. Structural Design and Anchorage: Comply with ASCE/SEI 7 for wind loads of up to 100 mph.

D. Hinged Doors: With padlocking provisions.

E. Space Heater: Thermostatically controlled and sized to prevent condensation.

F. Muffler Location: Within enclosure.

G. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.
3. Ventilation: Provide temperature-controlled exhaust fan interlocked to prevent operation when engine is running.

H. Convenience Outlets: Factory-wired GFCI. Arrange for external electrical connection.

2.10 VIBRATION ISOLATION DEVICES

A. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

B. Comply with requirements in Section 233113 "Metal Ducts" for vibration isolation and flexible connector materials for exhaust shroud and ductwork.

C. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.11 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.12 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with IEEE 115 and with NFPA 110, Level 1 Energy Converters.

B. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Test generator, exciter, and voltage regulator as a unit.
3. Full load run.
4. Maximum power.
5. Voltage regulation.
6. Transient and steady-state governing.
7. Single-step load pickup.
8. Safety shutdown.

9. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.

10. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Owner no fewer than seven working days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

3.3 INSTALLATION

A. Comply with NECA 1 and NECA 404.

B. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.

C. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

3. Install packaged engine generator with restrained spring isolators having a minimum deflection of 1 inch (25 mm) on 6-inch- high concrete base. Secure engine generator to anchor bolts installed in concrete bases.

D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

E. Exhaust System: Install Schedule 40, black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.

1. Install flexible connectors and steel piping materials according to requirements in Section 232116 "Hydronic Piping Specialties."
2. Insulate muffler/silencer and exhaust system components according to requirements in Section 230719 "HVAC Piping Insulation."

3. Install isolating thimbles where exhaust piping penetrates combustible surfaces with a minimum of 9-inch (225-mm) clearance from combustibles.

F. Drain Piping: Install condensate drain piping to muffler drain outlet with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe, the full size of the drain connection, with welded joints.

G. Gaseous Fuel Piping:

1. Natural gas piping, valves, and specialties for gas distribution are specified in Section 231123 "Facility Natural Gas Piping."

H. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.

C. Connect engine exhaust pipe to engine with flexible connector.

D. Gaseous Fuel Connections:

1. Connect fuel piping to engines with a gate valve and union and flexible connector.
2. Install manual shutoff valve in a remote location to isolate gaseous fuel supply to the generator.
3. Vent gas pressure regulators outside building a minimum of 60 inches (1500 mm) from building openings.

E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.

G. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

A. Identify system components according to Section 230553 "Identification for HVAC Piping and Equipment" and Section 260553 "Identification for Electrical Systems."

B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.6 FIELD QUALITY CONTROL

A. Testing Agency:

1. Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in the first two subparagraphs below as specified in the NETA ATS. Certify compliance with test parameters.

    a. Visual and Mechanical Inspection:

        1) Compare equipment nameplate data with drawings and specifications.
        2) Inspect physical and mechanical condition.
        3) Inspect anchorage, alignment, and grounding.
        4) Verify the unit is clean.

    b. Electrical and Mechanical Tests:

        1) Perform insulation-resistance tests in accordance with IEEE 43.

            a) Machines larger than 200 hp (150 kW). Test duration shall be 10 minutes. Calculate polarization index.
            b) Machines 200 hp (150 kW) or less. Test duration shall be one minute. Calculate the dielectric-absorption ratio.

        2) Test protective relay devices.
        3) Verify phase rotation, phasing, and synchronized operation as required by the application.
        4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.

        5) Perform vibration test for each main bearing cap.
        6) Verify correct functioning of the governor and regulator.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

    a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
    b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
    c. Verify acceptance of charge for each element of the battery after discharge.
    d. Verify that measurements are within manufacturer's specifications.

4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.

6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg (120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.

7. Exhaust Emissions Test: Comply with applicable government test criteria.
8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
9. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 percent and 100 percent of rated linear load. Verify that harmonic content is within specified limits.

10. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four locations on the property line, and compare measured levels with required values.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the last 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest as specified above.

I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 3 years' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include

routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

3.8 START UP SERVICE

A. Engage a factory-authorized service representative to start the generator and perform the field quality control requirement described above. Provide a complete report after successful startup of the unit.

3.9 DEMONSTRATION AND TRAINNING

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION

SECTION 26 36 00

TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes automatic transfer switches rated 600 V and less, including the following:

1. Bypass/isolation switches.
2. Remote annunciator and control system.

1.2 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 transfer switches.
2. Include rated capacities, operating characteristics, electrical characteristics, and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
2. Include material lists for each switch specified.
3. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.
4. Riser Diagram: Show interconnection wiring between transfer switches, bypass/isolation switches, annunciators, and control panels.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer-authorized service representative.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product 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. Features and operating sequences, both automatic and manual.
b. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. Member company of NETA.

a. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.6 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

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. Comply with NEMA ICS 1.

C. Comply with NFPA 99.

D. Comply with NFPA 110.

E. Comply with UL 1008 unless requirements of these Specifications are stricter.

F. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

G. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
2. Short-time withstand capability for [three] [30] <Insert number> cycles.

H. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

I. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

J. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.

K. Service-Rated Transfer Switch:

1. Comply with UL 869A and UL 489.
2. Provide terminals for bonding the grounding electrode conductor to the grounded service conductor.
3. In systems with a neutral, the bonding connection shall be on the neutral bus.
4. Provide removable link for temporary separation of the service and load grounded conductors.
5. Surge Protective Device: Service rated.
6. Ground-Fault Protection: Comply with UL 1008 for normal bus.
7. Service Disconnecting Means: Externally operated, manual mechanically actuated.

L. Neutral Switching: Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

M. Neutral Terminal: Solid and fully rated unless otherwise indicated.

N. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.

O. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.

P. Battery Charger: For generator starting batteries.

1. Float type, rated 10 A.
2. Ammeter to display charging current.

3. Fused ac inputs and dc outputs.

Q. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

R. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable shrinkable sleeve or tape markers at terminations. Color-coding and wire and cable markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
4. Accessible via front access.

S. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 CONTACTOR-TYPE AUTOMATIC TRANSFER SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cummins Power Generation.
2. Eaton.
3. Emerson.
4. GE Zenith Controls.
5. General Electric Company.
6. Hubbell Power Systems, Inc.

B. Comply with Level 1 equipment according to NFPA 110.

C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are unacceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Contactor-style automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.
4. Conductor Connectors: Suitable for use with conductor material and sizes.
5. Material: Hard-drawn copper, 98 percent conductivity.
6. Main and Neutral Lugs: [Compression] [Mechanical] type.
7. Ground Lugs and Bus-Configured Terminators: Mechanical type.
8. Ground bar.
9. Connectors shall be marked for conductor size and type according to UL 1008.

D. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.

1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.

E. Automatic Delayed-Transition Transfer Switches: Pauses or stops in intermediate position to momentarily disconnect both sources, with transition controlled by programming in the automatic transfer-switch controller. Interlocked to prevent the load from being closed on both sources at the same time.

1. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals for alternative source. Adjustable from zero to six seconds, and factory set for one second.
2. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.
3. Fully automatic break-before-make operation with center off position.
4. Fully automatic break-before-make operation with transfer when two sources have near zero phase difference.

F. Automatic Closed-Transition Transfer Switches: Connect both sources to load momentarily. Transition is controlled by programming in the automatic transfer-switch controller.

1. Fully automatic make-before-break operation when transferring between two available power sources.
2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.

    a. Initiation occurs without active control of generator.
    b. Automatic transfer-switch controller takes active control of generator to match frequency, phase angle, and voltage.
    c. Controls ensure that closed-transition load transfer closure occurs only when the two sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.

4. Failure of power source serving load initiates automatic break-before-make transfer.

G. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

H. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

I. Electric Switch Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternative Source." Switch shall be capable of transferring load in either direction with either or both sources energized.

J. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval shall be adjustable from 1 to 30 seconds.

K. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

L. Automatic Transfer-Switch Controller Features:

1. Controller operates through a period of loss of control power.
2. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.

b. Push-button programming control with digital display of settings.
c. Integral battery operation of time switch when normal control power is unavailable.

M. Large-Motor-Load Power Transfer:

1. In-Phase Monitor: Factory-wired, internal relay controls transfer so contacts close only when the two sources are synchronized in phase and frequency. Relay shall compare phase relationship and frequency difference between normal and emergency sources and initiate transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer shall be initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.
2. Motor Disconnect and Timing Relay Controls: Designated starters in loss of power scenario shall disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters shall be through wiring external to automatic transfer switch. Provide adjustable time delay between 1 and 60 seconds for reconnecting individual motor loads. Provide relay contacts rated for motor-control circuit inrush and for actual seal currents to be encountered.
3. Programmed Neutral Switch Position: Switch operator with programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Adjustable pause from 0.5 to 30 seconds minimum, and factory set for 0.5 second unless otherwise indicated. Time delay occurs for both transfer directions. Disable pause unless both sources are live.

2.3 MOLDED-CASE-TYPE AUTOMATIC TRANSFER SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cummins Power Generation.
2. Eaton.
3. Emerson.
4. GE Zenith Controls.
5. General Electric Company.
6. Hubbell Power Systems, Inc.

B. Comply with Level 1 equipment according to NFPA 110.

C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using contactor-based components are unacceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching.
4. Conductor Connectors: Suitable for use with conductor material and sizes.
5. Material: **Hard-drawn copper, 98 percent conductivity**.
6. Main and Neutral Lugs: **Mechanical** type.
7. Ground Lugs and Bus-Configured Terminators: **Mechanical** type.
8. Ground bar.
9. Connectors shall be marked for conductor size and type according to UL 1008.

D. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.

1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.

E. Automatic Delayed-Transition Transfer Switches: Pauses or stops in intermediate position to momentarily disconnect both sources, with transition controlled by programming in the automatic transfer-switch controller. Interlocked to prevent the load from being closed on both sources at the same time.

1. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals for alternative source. Adjustable from zero to six seconds, and factory set for one second.
2. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.
3. Fully automatic break-before-make operation with center off position.
4. Fully automatic break-before-make operation with transfer when two sources have near zero phase difference.

F. Automatic Closed-Transition Transfer Switches: Connect both sources to load momentarily. Transition is controlled by programming in the automatic transfer-switch controller.

1. Fully automatic make-before-break operation when transferring between two available power sources.
2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.

    a. Initiation occurs without active control of generator.
    b. Automatic transfer-switch controller takes active control of generator to match frequency, phase angle, and voltage.
    c. Controls ensure that closed-transition load transfer closure occurs only when the two sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.

4. Failure of power source serving load initiates automatic break-before-make transfer.

G. Manual Switch Operation, Load-Breaking: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

H. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval shall be adjustable from 1 to 30 seconds.

I. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

J. Transfer Switches Based on Molded-Case-Switch Components: Comply with UL 489 and UL 869A.

K. Automatic Transfer-Switch Controller Features:

1. Controller operates through a period of loss of control power.
2. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts:

    a. Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
    b. Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.

12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is unavailable.

L. Large-Motor-Load Power Transfer:

1. In-Phase Monitor: Factory-wired, internal relay controls transfer so contacts close only when the two sources are synchronized in phase and frequency. Relay shall compare phase relationship and frequency difference between normal and emergency sources and initiate transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer shall be initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.
2. Motor Disconnect and Timing Relay Controls: Designated starters in loss of power scenario shall disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters shall be through wiring external to automatic transfer switch. Provide adjustable time delay between 1 and 60 seconds for reconnecting individual motor loads. Provide relay contacts rated for motor-control circuit inrush and for actual seal currents to be encountered.
3. Programmed Neutral Switch Position: Switch operator with programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Adjustable pause from 0.5 to 30 seconds minimum, and factory set for 0.5 second unless otherwise indicated. Time delay occurs for both transfer directions. Disable pause unless both sources are live.

2.4 TRANSFER SWITCH ACESSORIES

A. Bypass/Isolation Switches:

1. Source Limitations: Same manufacturer as transfer switch in which installed.
2. Comply with requirements for Level 1 equipment according to NFPA 110.
3. Description: Manual type, arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Include the following features for each combined automatic transfer switch and bypass/isolation switch:

    a. Means to lock bypass/isolation switch in the position that isolates transfer switch with an arrangement that permits complete electrical testing of transfer switch while isolated. Interlocks shall prevent transfer-switch operation, except for testing or maintenance, while automatic transfer switch is isolated.
    b. Provide means to make power available to transfer-switch control circuit for testing and maintenance purposes.
    c. Drawout Arrangement for Transfer Switch: Provide physical separation from live parts and accessibility for testing and maintenance operations. Transfer switch and bypass/isolation switch shall be in isolated compartments.
    d. Transition: Provide closed-transition operation when transferring from main transfer switch to bypass/isolation switch on the same power source.
    e. Transition: Provide [open] [closed]-transition operation when transferring between power sources.
    f. Bypass/Isolation Switch Current, Voltage, Closing, and Short-Circuit Withstand Ratings: Equal to or greater than those of associated automatic transfer switch, and with same phase arrangement and number of poles.
    g. Contact temperatures of bypass/isolation switches shall not exceed those of automatic transfer-switch contacts when they are carrying rated load.

h. Manual Control: Constructed so load bypass and transfer-switch isolation can be performed by one person in no more than two operations in 15 seconds or less. Operating handles shall be externally operated.
i. Automatic and Nonautomatic Control: Automatic transfer-switch controller shall also control the bypass/isolation switch.
j. Legend: Manufacturer's standard legend for control labels and instruction signs shall describe operating instructions.
k. Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors.

4. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory-installed copper bus bars; plated at connection points and braced for the indicated available short-circuit current.

B. Remote Annunciator System:

1. Source Limitations: Same manufacturer as transfer switch in which installed.
2. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches.
3. Annunciation panel display shall include the following indicators:

a. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
b. Switch position.
c. Switch in test mode.
d. Failure of communication link.

4. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

a. Indicating Lights: Grouped for each transfer switch monitored.
b. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
c. Mounting: Flush, modular, steel cabinet unless otherwise indicated.
d. Lamp Test: Push-to-test or lamp-test switch on front panel.

C. Remote Annunciator and Control System:

1. Source Limitations: Same manufacturer as transfer switch in which installed.
2. Include the following functions for indicated transfer switches:

a. Indication of sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
b. Indication of switch position.
c. Indication of switch in test mode.
d. Indication of failure of digital communication link.
e. Key-switch or user-code access to control functions of panel.
f. Control of switch-test initiation.
g. Control of switch operation in either direction.
h. Control of time-delay bypass for transfer to normal source.

3. Malfunction of annunciator, annunciation and control panel, or communication link shall not affect functions of automatic transfer switch. In the event of failure of communication link, automatic transfer switch automatically shall revert to standalone, self-contained operation. Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation.
4. Remote Annunciation and Control Panel: Solid-state components. Include the following features:

    a. Controls and indicating lights grouped together for each transfer switch.
    b. Label each indicating light control group. Indicate transfer switch it controls, location of switch, and load it serves.
    c. Digital Communication Capability: Matched to that of transfer switches supervised.
    d. Mounting: Flush, modular, steel cabinet unless otherwise indicated.

2.5 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect components, assembled switches, and associated equipment according to UL 1008. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

B. Prepare test and inspection reports.

1. For each of the tests required by UL 1008, performed on representative devices, for emergency systems. Include results of test for the following conditions:

    a. Overvoltage.
    b. Undervoltage.
    c. Loss of supply voltage.
    d. Reduction of supply voltage.
    e. Alternative supply voltage or frequency is at minimum acceptable values.
    f. Temperature rise.
    g. Dielectric voltage-withstand; before and after short-circuit test.
    h. Overload.
    i. Contact opening.
    j. Endurance.
    k. Short circuit.
    l. Short-time current capability.
    m. Receptacle withstand capability.
    n. Insulating base and supports damage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.

1. Install transfer switches on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations per manufacturer's requirement.
2. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
3. Provide workspace and clearances required by NFPA 70.

B. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.

C. Identify components according to Section 260553 "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

E. Comply with NECA 1.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Wiring Method: Install cables in raceways and cable trays except within electrical enclosures. 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."

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

F. Connect twisted pair cable according to Section 260523 "Control-Voltage Electrical Power Cables."

G. Connect twisted pair cable according to Section 271513 "Communications Copper Horizontal Cabling."

H. Route and brace conductors according to manufacturer's written instructions. Do not obscure manufacturer's markings and labels.

I. Final connections to equipment shall be made with liquidtight, flexible metallic conduit no more than 18 inches in length.

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. After installing equipment, test for compliance with requirements according to NETA ATS.
2. Visual and Mechanical Inspection:

    a. Compare equipment nameplate data with Drawings and Specifications.
    b. Inspect physical and mechanical condition.
    c. Inspect anchorage, alignment, grounding, and required clearances.
    d. Verify that the unit is clean.
    e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
    f. Verify that manual transfer warnings are attached and visible.
    g. Verify tightness of all control connections.
    h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:

        1) Use of low-resistance ohmmeter.
        2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.

    i. Perform manual transfer operation.
    j. Verify positive mechanical interlocking between normal and alternate sources.
    k. Perform visual and mechanical inspection of surge arresters.
    l. Inspect control power transformers.

3. Electrical Tests:

    a. Perform insulation-resistance tests on all control wiring with respect to ground.
    b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
    c. Verify settings and operation of control devices.
    d. Calibrate and set all relays and timers.
    e. Verify phase rotation, phasing, and synchronized operation.
    f. Perform automatic transfer tests.
    g. Verify correct operation and timing of the following functions:

        1) Normal source voltage-sensing and frequency-sensing relays.
        2) Engine start sequence.
        3) Time delay on transfer.
        4) Alternative source voltage-sensing and frequency-sensing relays.
        5) Automatic transfer operation.
        6) Interlocks and limit switch function.
        7) Time delay and retransfer on normal power restoration.
        8) Engine cool-down and shutdown feature.

4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and

procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

a. Check for electrical continuity of circuits and for short circuits.
b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
c. Perform manual transfer operation.

5. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.

a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
b. Simulate loss of phase-to-ground voltage for each phase of normal source.
c. Verify time-delay settings.
d. Verify pickup and dropout voltages by data readout or inspection of control settings.
e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for one pole deviating by more than 50 percent from other poles.
g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

6. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

a. Verify grounding connections and locations and ratings of sensors.

D. Coordinate tests with tests of generator and run them concurrently.

E. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

F. Transfer switches will be considered defective if they do not pass tests and inspections.

G. Remove and replace malfunctioning units and retest as specified above.

H. Prepare test and inspection reports.

I. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

2. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
3. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.

B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.

C. Coordinate this training with that for generator equipment.

END OF SECTION 263600

SECTION 31 23 16

EXCAVATION - EARTH AND ROCK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for performing open-cut excavations to the widths and depths necessary for constructing structures, pipelines, and conduits including excavation of any material necessary for any purpose pertinent to the construction of the Work.

B. Related Work Specified in Other Sections Includes, but is Not Limited to, the Following:

1. Section 01 50 00 - Construction Facilities and Temporary Controls
2. Section 31 23 23 - Backfilling
3. Section 31 25 00 – Slope Protection and Erosion Controls
4. Section 31 41 00 - Shoring, Sheeting and Bracing

1.2 DEFINITIONS

A. Earth: "Earth" includes all materials which, in the opinion of the ENGINEER, do not require blasting, barring, or wedging for their removal from their original beds. Specifically excluded are all ledge and bedrock as well as pieces of masonry larger than one cubic yard in volume.

B. Rock: "Rock" includes all materials which, in the opinion of the ENGINEER, require ramming, barring, or wedging for removal from their original beds and which have compressive strengths in their natural undisturbed state in excess of 300 psi. Masonry larger than one cubic yard in volume is classed as rock excavation.

1.3 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

1.4 SITE CONDITIONS

A. Geotechnical Investigation: Geotechnical investigations and reports prepared are intended only for use by the OWNER and ENGINEER in preparing the Contract Documents.

1. The geotechnical investigation reports may be examined for whatever value it may be worth. However, this information is not guaranteed in accuracy or completeness.

2. The geotechnical investigation reports are included as an attachment in the Contract Documents.

B. Actual Conditions: Make any geotechnical investigations deemed necessary to determine actual site conditions.

C. Underground Utilities: Locate and identify all existing underground utilities prior to the commencement of Work.

D. Quality and Quantity: Make any other investigations and determinations necessary to determine the quality and quantities of earth and rock and the methods to be used to excavate these materials.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PREPARATION:

A. Contact J.U.L.I.E. and the City of Evanston Facility Management, Traffic Engineering, and Water and Sewer Divisions not less than three (3) working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Notify utility company to remove and relocate utilities.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, fences, lawns, rock outcroppings and other features remaining as a portion of final landscaping.

F. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.2 EXCAVATION SAFETY

A. Make all excavations in a safe manner. Provide appropriate measures to retain excavation side slopes and prevent rock falls to ensure that persons working in or near the excavation are protected.

B. Safety is the sole responsibility of the CONTRACTOR.

3.3 CODES, ORDINANCES, AND STATUTES

A. Familiarize with, and comply with, all applicable codes, ordinances, statutes, and bear sole responsibility for the penalties imposed for noncompliance.

B. Construction site erosion control must comply with the applicable erosion control ordinance and construction site erosion control plan and permit.

3.4 GENERAL

A. Implement erosion and sediment control as detailed in Section 01 50 00 and Section 31 25 00.

B. Banks: Shore or slope banks to the angle of repose to prevent slides or cave-ins in accordance with Section 31 41 00.

C. Prevent water from entering the trench to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill. Ensure that dewatering of surface water that enters the excavation is provided for proper completion of the work and protection of their equipment and materials.

D. All excavated soil shall be spread, piled, or removed from site.

E. Do not interfere with 45 degree bearing splay of foundations. Where interference is unavoidable, provide a foundation stabilization plan for approval by ENGINEER.

F. Walls and faces of excavations shall be protected against slides and cave-ins by sloping of ground, or by a shoring system, trench box, sheeting, sheet piling, cribbing, or equivalent means of protection.

G. Take care not to disturb the bottom of the excavation.

H. Do not damage existing underground mechanical and electrical utilities and systems encountered during excavation activities.

I. Where possible interferences are indicated or expected to exist, hand-excavate to expose and locate them during excavating operations.

J. Piles of excavated material shall not be allowed to accumulate, cause interference with performance of the work or be placed to prevent proper drainage of surface water.

K. Include breaking up, removal, and disposal of existing roadways, and removal and cleaning out of entire excavated area, pits, trenches, pavement, parking lots, and similar excavation for proper completion of the work.

L. Remove existing concrete, bituminous paving, concrete walks, and curbs within areas of construction.

M. Remove material from excavations. This includes fragments of brick, cinders, concrete, gravel, rock fragments, lumped subsoil, boulders and rock, and miscellaneous loose fill.

N. Concrete, excess material, and debris shall be legally disposed of.

O. Correct over excavated areas.

3.5 STRUCTURE EXCAVATION

A. Excavation Size: Provide excavations only of sufficient size to permit the Work to be economically and properly constructed in the manner and of the size specified.

B. Excavation Shape: Shape and dimension the bottom of the excavation in earth or rock to the shape and dimensions of the underside of the structure or drainage blanket wherever the nature of the excavated material permits.

C. Excavation Limits: Responsibility of the limits of construction are the sole responsibility of the CONTRACTOR. Careless excavation by the CONTRACTOR outside of limits of construction and subsequent work is not cause for additional compensation by the OWNER.

D. Compaction: Before placing foundation slabs, footings, or backfill, proof roll the bottom of the excavations to detect soft spots.

1. For accessible areas, proof roll with a ten-wheel tandem axle dump truck loaded to at least 15 tons or similarly loaded construction equipment.

2. For small areas, proof roll with a smooth-faced steel roller filled with water or sand, or compact with a mechanical tamper.

3. Make one complete coverage, with overlap, of the area.

4. Over excavate soft zones and replace with compacted select fill in accordance with Section 31 23 23.

3.6 PIPE TRENCH EXCAVATION

A. Identify required lines, levels, contours, and datum locations. Confirm exact pipe alignment and grades. Alignment and grade shall generally conform to the alignment and grade provided in the Drawings, however, avoid all existing and proposed facilities, buildings, structures, equipment, and other buried pipelines and utilities. In general, where a pressurized main crosses a gravity flow pipe, the gravity pipe alignment and grade shall have the priority.

B. Responsibility of the pipe trench limits of construction are the sole responsibility of the CONTRACTOR. Careless excavation by the CONTRACTOR outside of limits of construction and subsequent work is not cause for additional compensation by the OWNER.

C. In general, pipe shall be installed in vertical and horizontal directions and parallel to building lines and other existing or proposed pipelines unless shown otherwise. Avoid unnecessary bends, fittings, deflections, or other means which prevent straight and uniform flow of pipe media.

D. Properly brace and protect trees, shrubs, poles and other structures which are to be preserved. Unless shown or specified otherwise, preserve all trees and large shrubs. Hold damage to the root structure to a minimum. Small shrubs may be preserved or replaced with equivalent specimens.

E. Adequate Space: Keep the width of trenches to a minimum, however, provide adequate space for workers to place, joint and backfill the pipe properly.

1. Do not allow the clear width of the trench at the level of the top of the pipe to exceed the sum of the outside diameter of the pipe barrel plus 20 inches for pipe 4 through 18 inches in diameter nor the outside diameter of the pipe barrel plus 24 inches for pipe 24 inches in diameter or larger, unless otherwise approved by ENGINEER.

2. In sheeted trenches or when trench boxes are used, measure the clear width of the trench at the level of the top of the pipe to the inside of the sheeting.

3. Should the maximum trench widths specified above be exceeded without written approval, provide concrete cradle or encasement for the pipe as directed. No separate payment will be made for such concrete cradle or encasement.

F. Depth: Excavate to the lines and grades as shown on the Drawings. Excavate trenches to a minimum depth of 4 inches below the bottom of the pipe or the bottom of encasement for electrical ducts, unless otherwise shown, specified, or directed, so that pipe bedding material can be placed in the bottom of the trench and shaped to provide a continuous, firm bearing for duct encasement, pipe barrels, and bells.

1. If, without direction from the ENGINEER, the trench has been excavated below the required depth for pipe bedding material placement, fill the excess depth with pipe bedding material as specified herein to the proper sub-grade.

G. Unstable Materials: If unstable material is exposed at the level of the bottom of the trench excavation, excavate the material in accordance with the subsection headed "Authorized Additional Excavation".

1. When, in the judgment of the ENGINEER, the unstable material extends to an excessive depth, the ENGINEER may advise, in writing, the need for stabilization of the trench bottom with additional pipe bedding material, crushed stone, or gravel mat or the need to provide firm support for the pipe or electrical duct by other suitable methods.

2. Payment for such trench stabilization will be made under the appropriate Contract Items.

H. Length of Excavation: Keep the open excavated trench preceding the pipe or electrical duct laying operation and the unfilled trench, with pipe or duct in place, to a minimum length which causes the least disturbance. Provide ladders for a means of exit from the trench as required by applicable safety and health regulations.

I. Water: Allow no water to rise in the trench excavation until sufficient backfill has been placed to prevent pipe or duct flotation. Pipe shall not be laid in water.

J. Backfill all pipe trenches at the completion of work each day.

3.7 ROCK EXCAVATION

A. Rock Excavation: Excavate rock within the boundary lines and grades as shown, specified, or required.

1. Excavate and remove rocks by mechanical methods. Cut away at bottom of excavation to form level bearing.

2. Rock removed from the excavation becomes the property of the CONTRACTOR. Handle, transport, and dispose of excavated rock at an off-site disposal location. Obtain the off-site disposal location.

3. Remove all shattered rock and loose pieces.

4. Rocks / stones larger than 8 inches in any direction shall not be used for backfill material.

B. Structure Depths: For cast-in-place structures, excavate the rock only to the bottom of the structure, foundation slab, or drainage blanket.

C. Trench Depth: For trench excavation in which pipelines or electrical ducts are to be placed, excavate the rock to a minimum depth of 6 inches below the bottom of the pipe or duct encasement and refill the excavated space with pipe bedding material. Include placing, compacting and shaping pipe bedding material in the appropriate rock excavation Bid items.

D. Manhole Depths: For manhole excavation, excavate the rock to a minimum depth of 8 inches below the bottom of the manhole base for pipelines 24 inches in diameter and larger and 6 inches below the bottom manhole base for pipelines less than 24

inches in diameter. Refill the excavated space with pipe bedding material. Include placing, compacting and shaping pipe bedding material for manhole bases in the appropriate rock excavation Bid items.

E. Over-Excavated Space: Refill the excavated space in rock below structures, pipelines, conduits, and manholes, which exceeds the specified depths with Class D concrete, pipe bedding, flowable fill, select fill, or other material as directed. Include refilling of over-excavated space in rock as part of the rock excavation Bid items.

F. Payment: Rock excavation, including ramming, removing from trench, handling, stockpiling, and hauling off-site will be paid for under the appropriate rock excavation Bid items. Placing, compacting and shaping of the additional pipe bedding material or fill material, as required will be considered incidental to the rock excavation cost.

G. Blasting: Blasting will not be permitted.

3.8 FINISHED EXCAVATION

A. Finish: Provide a reasonably smooth finished surface for all excavations, which is uniformly compacted and free from irregular surface changes.

B. Finish Methods: Provide a degree of finish which is ordinarily obtainable from blade-grade operations, except as otherwise specified in Section 31 23 23.

3.9 PROTECTION

A. Traffic and Erosion: Protect newly graded areas from traffic and from erosion.

B. Provide adequate fencing / barriers for fall protection around all open excavations.

C. Where excavations are to be left open overnight in a non-controlled site such as the regraded slope or the trench drain alignment, cover the entire excavation with steel road plate to provide full fall protection.

D. Repair: Repair any settlement or washing away that may occur from any cause, prior to acceptance. Re-establish grades to the required elevations and slopes.

E. Other Requirements: Conduct all Work in accordance with the environmental protection requirements specified in Section 01 50 00.

3.10 AUTHORIZED ADDITIONAL EXCAVATION

A. Additional Excavation: Carry the excavation to such additional depth and width as authorized in writing from the ENGINEER, for the following reasons:

1. In case the materials encountered at the elevations shown are not suitable.

2. In case it is found desirable or necessary to go to an additional depth, or to an additional depth and width.

B. Refill Materials: Refill such excavated space with either authorized Class D concrete, pipe bedding, flowable fill, or select fill material as authorized by the ENGINEER.

C. Compaction: Where necessary, compact fill materials to avoid future settlement to densities specified in Section 31 23 23 or to the satisfaction of the ENGINEER.

D. Payment: Additional earth excavations so authorized and concrete, pipe bedding, flowable fill, or select fill materials authorized for filling such additional excavation and compaction of select fill materials will be paid for under the appropriate Contract Items or where no such items exist, as a change in the Work.

3.11 UNAUTHORIZED EXCAVATION

A. Stability: Refill any excavation carried beyond or below the lines and grades shown, except as specified in the subsection headed "Authorized Additional Excavation", with such material and in such manner as may be approved to provide for the stability of the various structures.

B. Refill Materials: Refill spaces beneath all manholes, structures, pipelines, or conduits excavated without authority with Class D concrete, pipe bedding, flowable fill, or select fill material, as approved.

C. Payment: Refill for unauthorized excavation will not be measured and no payment will be made.

3.12 SEGREGATION STORAGE AND DISPOSAL OF MATERIAL

A. Stockpiling Suitable Materials: Stockpile topsoil suitable for final grading and landscaping and excavated material suitable for backfilling or embankments separately on the site in approved locations.

B. Stockpile Locations: Store excavated and other material a sufficient distance away from the edge of any excavation to prevent its falling or sliding back into the excavation and to prevent collapse of the wall of the excavation. Provide not less than 2 feet clear space between the top of any stockpile and other material and the edge of any excavation.

C. Excess Materials: Transport and dispose of surplus excavated material and excavated material unsuitable for backfilling or embankments at an off-site disposal location. Obtain the off-site disposal location.

3.13 REMOVAL OF WATER

A. Water Removal: During excavation and until completion and acceptance of the Work at final inspection, provide ample means and equipment with which to remove

promptly and dispose properly water entering any excavation or other parts of the Work in accordance with the requirements of Section 31 23 23.

B. Dry Excavations: Keep the excavation dry.

C. Water Contact: Allow no water to rise over or contact masonry and concrete until the concrete and mortar have attained a set and, in any event, not sooner than 12 hours after placing the masonry or concrete.

D. Discharge of Water: Dispose of water pumped or drained from the Work in a safe and suitable manner without damage to adjacent property or streets or to other work under construction.

E. Protection: Provide adequate protection for water discharged onto streets. Protect the street surface at the point of discharge.

F. Sanitary Sewers: Discharge no water into sanitary sewers.

G. Storm Sewers: Discharge no water containing settleable solids into storm sewers.

H. Repair: Promptly repair all damage caused by dewatering the Work.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 31 23 23

BACKFILLING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Backfilling all excavation to the original surface of the ground or to such other grades as may be shown or required. Obtain approval before backfilling against masonry structures. Remove from all backfill, any compressible, putrescible, or destructible rubbish and refuse and all lumber and braces from the excavated space before backfilling is started. Remove sheeting.

B. Equipment Limitations: Do not permit construction equipment used to backfill to travel against and overcast-in-place concrete structures until the specified concrete strength has been obtained, as verified by concrete test cylinders. In special cases where conditions warrant, the above restriction may be modified providing the concrete has gained sufficient strength, as determined from test cylinders, to satisfy design requirements for the removal of forms and the application of load.

C. Related Work Specified in Other Sections Includes, but is Not Limited to, the Following:

1. Section 31 23 16 - Excavation - Earth and Rock
2. Section 31 25 00 – Slope Protection and Erosion Control
3. Section 31 41 00 – Shoring, Sheeting, and Bracing

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ASTM D 1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))

2. ASTM D6936 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

3. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

1.3 SUBMITTALS

A. Provide all submittals, including the following in accordance with Division 1.

1. Certified laboratory reports of all proposed backfill material.

PART 2 PRODUCTS

2.1 BACKFILL MATERIAL - GENERAL

A. General: Backfill with sound materials, free from waste, organic matter, rubbish, boggy, or other unsuitable materials.

B. General Materials Requirements: Conform materials used for backfilling to the requirements specified. Follow common fill requirements whenever specialized fill is not specified. Determine and obtain the approval of the appropriate test method where more than one compaction test method is specified.

C. Frozen Materials: Do not use frozen material for backfilling.

2.2 SELECT FILL

A. Materials for Select Fill: Use gravel, crushed stone, limestone screenings or other granular or similar material as approved which can be readily and thoroughly compacted to 95 percent of the maximum dry density obtainable by ASTM D 1557 or use IDOT standard gradation CA 6 aggregate.

1. Grade select fill between the following limits:

U.S. Standard Sieve	Percent Passing by Weight
2 inch	100
1-1/2 inch	90-100
1 inch	75-95
1/2 inch	45-70
#4	25-50
#10	15-40
#200	5-15

2. Very fine sand, uniformly graded sands and gravels, or other materials that tend to flow under pressure when wet are unacceptable as select fill.

2.3 PIPE BEDDING

A. Bedding material may be crushed stone chips made from crushing sound limestone or dolomite, crushed or uncrushed gravel, crushed steel furnace slag, or air-cooled blast furnace slag. The material shall be hard, tough, and durable.

1. Material shall conform substantially to the gradations listed below or IDOT standard gradation CA7.

Grading Requirements for ¾-inch Crushed Stone Chips
(ASTM C 33 – AASHTO No. 67)

U.S. Standard Sieve	Percent Passing by Weight
1 inch	100
3/4 inch	90-100
3/8 inch	20-55
#4	0-10
#8	0-5

2.4 COMMON FILL

A. Materials for Common Fill: Material from on-site excavation may be used as common fill if it can be readily compacted to 90 percent of the maximum dry density obtainable by ASTM D 1557 and does not contain unsuitable material. Select fill may be used as common fill at no change in the Contract Price.

B. Granular Materials On-Site: Granular on-site material, which is fairly well graded between the following limits may be used as granular common fill:

U.S. Standard Sieve	Percent Passing by Weight
3 inch	100
#10	50-100
#60	20-90
#200	0-20

C. Cohesive Materials On-Site: Cohesive site material may be used as common fill.

1. The gradation requirements do not apply to cohesive common fill.

2. Use material having a liquid limit less than or equal to 40 and a plasticity index less than or equal to 20.

D. Material Approval: All material used as common fill is subject to approval. If there is insufficient on-site material, import whatever additional off-site material is required which conforms to the specifications and at no additional cost.

2.5 GEOTEXTILE FABRIC

A. Provide non-woven, permeable, synthetic fiber material designed to prevent fine soil particles from migrating through the material. Provide geotextile filter fabric in accordance with Section 645 of the State Specifications.

B. Protect geotextile during storage from becoming wet, coming in contact with soil, cement, or other foreign materials, and from exposure to sunlight.

PART 3 EXECUTION

3.1 ELECTRICAL DUCT AND PRECAST MANHOLE BEDDING

A. Bedding Compaction: Bed all electrical ducts and precast manholes in well graded, compacted select fill. Extend electrical duct bedding a minimum of 12 inches below the bottom of the duct encasement for the full trench width. Compact bedding thickness no less than 8 inches for precast concrete manhole bases.

B. Concrete Work Mats: Cast cast-in-place manhole bases and other foundations for structures against a Class D concrete work mat in clean and dry excavations, unless otherwise shown, specified, or required.

C. Bedding Placement: Place pipe bedding used for bedding beneath electrical ducts and precast manhole bases, in uniform layers not greater than 9 inches in loose thickness.

3.2 PIPE BEDDING

A. Provide pipe bedding material under all pipe for the full width of the trench. Minimum depth of bedding material below the pipe barrel shall be 6 inches. Hand-grade bedding to proper grade ahead of pipe laying operation. Bedding shall provide a firm unyielding support along the entire pipe length.

B. The pipe zone shall be considered to include the full width of the excavated trench from the bottom of the trench to a point 12 inches above the top outside surface of the barrel of the pipe.

C. Particular attention must be given to the area of the pipe zone from the flow line to the spring line of the pipe to insure that firm support is obtained to prevent any lateral movement of the pipe during the final placement of cover material in the pipe zone.

D. Pipe Zone:

1. Place pipe bedding material as specified herein to proper grade and elevation and for the full width of the trench. Before the pipe is laid, compact the bedding material to provide a firm, unyielding support for the pipe. Excavate as required to accommodate the pipe bell.

2. Care shall be taken to ensure that the pipe is uniformly supported on the barrel throughout its entire length.

3. After the pipe is laid to line and grade, place, and carefully compact pipe bedding material for the full width of the trench to the spring line of the pipe. Place the material around the pipe in 6-inch layers and thoroughly hand tamp with approved tamping sticks supplemented by "walking in" and slicing with a shovel to assure that all voids are filled.

4. Place and carefully compact the area above the pipe spring line with pipe bedding material to a point 12 inches above the top outside surface of the pipe barrel. Compaction above pipe shall be done only when sufficient cover over the pipe has been achieved to prevent damage to the pipe.

E. Large Stone Placement: Do not place large stone fragments in the pipe bedding or backfill to 1 foot over the top of pipes, nor nearer than 2 feet at any point from any pipe, conduit, or concrete wall.

F. Unallowed Materials: Pipe bedding containing very fine sand, uniformly graded sands and gravels, or other materials that tend to flow under pressure when wet is unacceptable.

3.3 TRENCH BACKFILL

A. General: Backfill trenches from 12 inches over the top of the pipe, from the top of electrical duct bedding or as shown to the bottom of pavement base course, subgrade for lawns or lawn replacement, to the top of the existing ground surface or to such other grades as may be shown or required.

B. Backfill trenches to contours and elevations with unfrozen fill materials.

C. Backfill simultaneously on each side of free-standing structures and pipe.

D. Materials: Provide select fill, pipe bedding, flowable fill, suitable job-excavated material, or other material, as specified and as approved for trench backfill. Common fill shall be used as backfill material above the pipe cover material.

E. Depth of Placement - General: Except under pavements, walkways, railroad tracks, and street or highway appurtenances, or as otherwise specified, place trench backfill in uniform layers not greater than 9 inches in loose thickness and thoroughly compact in place using suitable mechanical or pneumatic equipment. Compact

backfill to not less than 90 percent of the maximum dry density as determined by ASTM D 1557.

F. Depth of Placement - Traffic Areas and Under Utilities: Where pavements, walkways, and street or highway appurtenances are to be placed over trenches (except in tunnels) and under utilities or utility services crossing the trench, provide trench backfill using select fill, unless flowable fill is required per the Drawings or specifications.

G. Depth of Placement - Undeveloped Areas: In nondeveloped areas and where select fill material or hand-placed backfill are not specified or required, place common fill, suitable job-excavated material or other approved backfill in lifts not exceeding 9 inches in loose thickness. When the trench is full, consolidate the backfill by jetting, spading, tamping, or puddling to ensure complete filling of the excavation. Mound the top of the trench approximately 12 inches to allow for consolidation of backfill.

H. Dropping of Material on Work: Do trench backfilling work in such a way as to prevent dropping material directly on top of any conduit or pipe through any great vertical distance. Do not allow backfilling material from a bucket to fall directly on a structure or pipe and, in all cases, lower the bucket so that the shock of falling earth will not cause damage.

I. Distribution of Large Materials: Break lumps up and distribute any stones, pieces of crushed rock or lumps which cannot be readily broken up, throughout the mass so that all interstices are solidly filled with fine material.

3.4 STRUCTURE BACKFILL

A. Use of Select Fill: Use select fill underneath all structures, and adjacent to structures where pipes, connections, electrical ducts, and structural foundations are to be located within this fill. Use select fill beneath all pavements and walkways extend to the bottom of pavement base course or ballast.

1. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable approved mechanical or pneumatic equipment.

2. Compact backfill to not less than 95 percent of the maximum dry density as determined by ASTM D 1557.

3. For backfill under the water storage reservoirs, compact backfill to not less than 98 percent of the maximum dry density as determined by ASTM D 1557.

B. Use of Pipe Bedding: Use pipe bedding as described in 3.2 except where pipe is to be located within Select Fill adjacent to a structure as described in Article 3.4, Paragraph A.

C. Use of Common Fill: Use common granular fill adjacent to structures in all areas not specified above, unless otherwise shown or specified. Select fill may be used in place of common granular fill at no additional cost.

1. Extend such backfill from the bottom of the excavation or top of bedding to the bottom of subgrade for lawns or lawn replacement, the top of previously existing ground surface or to such other grades as may be shown or required.

2. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable equipment, as specified above.

3. Compact backfill to not less than 90 percent of the maximum dry density as determined by ASTM D 1557.

D. Use of Clay: In unpaved areas adjacent to structures for the top 1 foot of fill directly under lawn subgrades use clay backfill placed in 6-inch lifts. Compact clay backfill to not less than 90 percent of the maximum dry density as determined by ASTM D 1557.

1. Use clay having a liquid limit less than or equal to 40 and a plasticity index less than or equal to 20.

3.5 EARTH EMBANKMENTS

A. Use of Cohesive Materials: Make all earth embankments of approved cohesive common fill material.

1. Place fill in uniform layers not greater than 10 inches in loose thickness. Compact in place with suitable approved mechanical equipment.

2. Compact earth embankments to not less than 90 percent of the maximum dry density as determined by ASTM D 1557.

3. Do not use cohesionless, granular material as earth embankment backfill, unless otherwise shown or required.

3.6 COMPACTION EQUIPMENT

A. Equipment and Methods: Carry out all compaction with suitable approved equipment and methods.

1. Compact clay and other cohesive material with sheep's-foot rollers or similar equipment where practicable. Use handheld pneumatic tampers elsewhere for compaction of cohesive fill material.

2. Compact low cohesive soils with pneumatic-tire rollers or large vibratory equipment where practicable. Use small vibratory equipment elsewhere for compaction of cohesionless fill material.

3. Do not use heavy compaction equipment over pipelines or other structures, unless the depth of fill is sufficient to adequately distribute the load.

3.7 FINISH GRADING

A. Final Contours: Perform finish grading in accordance with the completed contour elevations and grades shown and blend into conformation with remaining natural ground surfaces.

1. Leave all finished grading surfaces smooth and firm to drain.

2. Bring finish grades to elevations within plus or minus 0.10 foot of elevations or contours shown.

B. Surface Drainage: Perform grading outside of building or structure lines in a manner to prevent accumulation of water within the area. Where necessary or where shown, extend finish grading to ensure that water will be carried to drainage ditches, and the site area left smooth and free from depressions holding water.

3.8 RESPONSIBILITY FOR AFTER SETTLEMENT

A. After Settlement Responsibility: Take responsibility for correcting any depression which may develop in backfilled areas from settlement within one year after the work is fully completed. Provide as needed, backfill material, pavement base replacement, permanent pavement, sidewalk, curb and driveway repair or replacement, and lawn replacement, and perform the necessary reconditioning and restoration work to bring such depressed areas to proper grade as approved.

3.9 INSPECTION AND TESTING OF BACKFILLING

A. Sampling and Testing: Sampling and testing of all in-place backfill and concrete will be provided in accordance with Division 01 – General Requirements: Section 01 45 00 – Quality Control.

B. Testing completed shall be per the following standards:

1. Tests and analysis of fill material will be performed in accordance with ASTM D2922 and ASTM D3017.

2. Compaction testing will be performed in accordance with ASTM 698, ASTM D2992, and ASTM D3017.

C. If initial testing reveals non-compliance with Contract requirements, remove existing work, replace and retest at no cost to OWNER. All additional testing will be made at the CONTRACTOR'S expense.

D. Correction of Work: Correct any areas of unsatisfactory compaction by removal and replacement, or by scarifying, aerating, or sprinkling as needed and recompaction in place prior to placement of a new lift.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 31 25 00

SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: The requirements for providing slope protection and erosion control practices for all areas within the contract limits and other area indicated, including work designated in permits and other agreements, as specified in Division 1.

B. Related Work Specified in Other Sections Includes, but is Not Limited to, the Following:

1. Section 02 41 00 - Demolition
2. Section 31 23 16 - Excavation - Earth and Rock
3. Section 31 23 23 - Backfilling
4. Section 32 90 00 - Landscaping Work

1.2 REFERENCES

A. Illinois Department of Transportation (IDOT)

1. Erosion and Sediment Control Field Guide for Construction: SU_2IM_ESCFieldGuideWorking_08232010.pdf (illinois.gov)

B. Metropolitan Water Reclamation District of Greater Chicago (MWRD)

1. Watershed Management Ordinance: MWRD - Watershed Management Ordinance

C. U.S. Environmental Protection Agency (USEPA):

1. Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites. http://www.epa.gov/npdes/pubs/sw_swppp_guide.pdf

1.3 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

B. Erosion and Sediment Control Plan: Submit an Erosion and Sediment Control Plan conforming to the requirements of Cook County and of the Division of Water Pollution Control of the Illinois Environmental Protection Agency.

C. Submit copies of all required permits to the ENGINEER before performing any work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 EROSION AND SEDIMENT CONTROL PLAN

A. General: Prepare an Erosion and Sediment Control Plan to include erosion control practices as specified in the most current edition of the Standards and Specifications for Soil Erosion and Sediment Control, prepared by the Illinois Environmental Protection Agency, Division of Water Pollution Control, Permit Section.

B. Contents: Prepare the Erosion and Sediment Control Plan to include but not limited to the following information:

1. Total square area disturbed by excavation.

2. Quantity of erosion control practices to be provided. For instance, feet of vegetative control, feet of interceptor ditches, feet of berms, cubic feet of silt traps, etc.

3. Approximate square feet of area controlled by the erosion control practices as specified in the Erosion and Sediment Control Plan, and the type of erosion control practices, whether permanent or temporary.

4. Topographical or plan maps of construction area with areas marked to indicate erosion control practices used.

5. Drainage area, including construction site.

6. Area of construction site in acres that fall in the following slope categories:

   a. 0-2 percent slope
   b. 3-4 percent slope
   c. 4-6 percent slope
   d. 6 percent and storm slope

7. A summary of the disposition of the collected sediment from the slope areas listed in Item 6.

C. Availability: Keep the Erosion and Sediment Control Plan at the construction site at all times available for inspection for the entire construction period.

D. Ordinances: Comply with all erosion and siltation control ordinances in effect and required by governing bodies having jurisdiction over the construction site and provide appropriate control measures as required.

3.2 EROSION AND SEDIMENT CONTROL

A. Provide necessary precautions and facilities to protect all indicated areas within the Contract Limits from discharges resulting from construction operations, excessive erosion runoff of the construction site, silting and any other contamination resulting from construction work. Provide erosion control practices conforming to the specified requirements and to include but not limited to the following provisions:

1. Place all erosion and siltation control measures prior to or as the first step in grading.

2. Mulch and seed all storm and sanitary sewer trenches not in streets within 15 days after backfill. Do not allow more than 500 feet of trenches to be open at any one time.

3. Place all excavated material on the uphill side of trenches where possible. Do not place materials in stream beds. Seed any stockpiled material which remains in place longer than thirty days with temporary vegetation and mulch.

4. Mulch and seed all temporary earth berms, diversions, erosion barriers and temporary stockpiles with temporary vegetative cover within 10 days after grading.

5. Do not stockpile or otherwise place dredged, excavated, or other material, at any time, in or near a stream bed which may increase the turbidity of the water. If turbidity producing materials are present, hold surface drainage from cuts and fills within the construction limits and from borrow and waste disposal areas in suitable sedimentation ponds or grade surface drainage to control erosion within acceptable limits. Provide and maintain temporary erosion and sediment control measures such as berms, dikes, drains, or sedimentation basins, if required to meet the above standards, until permanent drainage and erosion control facilities are completed and operative. Hold to a minimum the area of bare soil exposed at any one time by construction operations.

6. Drain wet dredged material for a minimum of 7 days. Store the material for drainage to a maximum height of 4 feet.

7. Provide temporary erosion and sediment control measures to include but not be limited to the following:

   a. Installation (and ultimate removal) of silt screens.

   b. Straw bales and silt traps around construction areas for all required structures.

c. Diked area with earth berm and silt trap for draining dredged material.

d. Straw bales with silt traps along top of slope of fill area plus seeding and mulching of entire fill area not otherwise protected.

END OF SECTION

SECTION 31 41 00

SHORING, SHEETING AND BRACING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Work required for protection of an excavation or structure through shoring, sheeting, and bracing.

B. Related Work Specified in Other Sections Includes, but is Not Limited to, the Following:

1. Section 31 23 16 - Excavation - Earth and Rock
2. Section 31 23 23 - Backfilling

1.2 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

B. CONTRACTOR's Submittals: Submit a CERTIFICATE (ONLY), signed and sealed by a Licensed Professional Engineer experienced in Structural Engineering and registered in the State where the construction will be performed, that certifies that the Licensed Professional Engineer has evaluated and approved the CONTRACTOR's excavation plan and has prepared complete design calculations including a global stability check and working drawings for the shoring, sheeting and bracing, not specifically shown on the Contract Drawings, which will be used for excavation support. Provide a separate CERTIFICATE for each excavation before starting the excavation. Where commercially manufactured trench boxes are to be used, provide a CERTIFICATE from the CONTRACTOR's Licensed Professional Engineer stating the conditions under which the trench boxes will be used.

1.3 REFERENCES

A. Codes and standards referred to in this Section are:

1. All Federal, State, and local laws and regulations applying to the design and construction of shoring, sheeting, and bracing.

2. National Bureau of Standards Building Science Series 127 "Recommended Technical Provisions for Construction Practice in Shoring and Sloping Trenches and Excavations."

PART 2 PRODUCTS

2.1 MANUFACTURERS AND MATERIALS

A. Use manufacturers and materials for shoring, sheeting, and bracing as recommended by the CONTRACTOR's Licensed Professional Engineer who designed the shoring, sheeting, and bracing. Where wood lagging is to be left in place use oak or treated fir or treated pine. Use only environmentally safe treatment for wood lagging.

PART 3 EXECUTION

3.1 SHORING, SHEETING AND BRACING INSTALLATION

A. General: Provide safe working conditions, prevent shifting of material, prevent damage to structures or other work, and avoid delay to the work, all in accordance with applicable laws and regulations. Properly shore, sheet, and brace all excavations that are not cut back to the proper slope, as determined by the CONTRACTOR's Licensed Professional Engineer.

1. Take sole responsibility for the design and adequacy of shoring, sheeting, and bracing not shown on the Contract Drawings.

2. Take sole responsibility for the methods of installation of the shoring, sheeting, and bracing.

B. Arrange shoring, sheeting, and bracing so as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength.

C. If the CONTRACTOR or its Licensed Professional Engineer is of the opinion that at any time the CONTRACTOR's excavation plan, shoring, sheeting, or bracing is inadequate or unsuited for the purpose, take immediate and appropriate action. Provide a new CERTIFICATE if the CONTRACTOR's excavation plans, shoring, sheeting, or bracing require modifications.

D. Monitoring:

1. Monitor horizontal and vertical deflections of sheeting, shoring, and bracing.

E. Accurately locate all underground utilities and take the required measures necessary to protect them from damage. All underground utilities shall be kept in service at all times as specified in Division 1.

F. Remove shoring, sheeting, and bracing as the excavation is refilled in a manner to avoid the caving in of the bank or disturbance to adjacent areas or structures or pipe bedding.

1. Carefully fill voids left by the withdrawal of the shore, sheeting and bracing. No separate payment will be made for the filling of such voids.

2. If pipe bedding is disturbed, re-compact it to meet specified density requirements.

G. Permission for Removal: Obtain permission from the CONTRACTOR's Licensed Professional Engineer before the removal of any shoring, sheeting, or bracing. Retain the responsibility for injury to structures or to other property or persons for failure to leave such shoring, sheeting, and bracing in place even though permission for removal has been obtained.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 32 11 23

AGGREGATE BASE COURSE AND GRANULAR SUBBASE COURSE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for material and installation of Aggregate Base Course and Granular Subbase Course for asphalt pavement, concrete pavement, concrete sidewalk, or for the use as temporary roadways, using Illinois Department of Transportation Standard Specifications, adopted January 1, 2012.

B. The work includes, but is not limited to the following items, as indicated on the Design Drawings and as specified herein:

1. The subgrade will be prepared according to IDOT Standard Specifications Section 301, except Articles 301.05 & 301.06 will not apply.

2. Providing aggregate materials from offsite sources, including transportation to the site and all handling and stockpiling of material cost will be included.

3. Placement of aggregate base and granular subbase course will be constructed in lifts as specified by the IDOT Standard Specifications.

4. Compaction of granular materials will be performed immediately according to the material per IDOT Standard Specification Article 311 and 351.

5. Final finish and completion of aggregate base and granular subbase courses will be smooth and conform to the alignment, grades, and cross sections shown on the Drawings.

6. Protection and repair of completed aggregate base and granular subbase courses.

C. Related Work specified in other sections includes, but is not limited to, the following:

1. Section 01 33 00 - Submittals
2. Section 01 73 29 - Cutting and Patching
3. Section 31 10 00 - Site Clearing
4. Section 31 23 16 - Excavation Earth and Rock
5. Section 31 23 23 - Backfilling
6. Section 32 12 00 - Asphalt Paving
7. Section 32 13 00 - Concrete Paving
8. Section 32 16 23 - Sidewalks

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. IDOT (Illinois Department of Transportation) Standard Specifications – "Standard Specifications for Road and Bridge Construction," adopted January 1, 2012 or latest version including the latest supplemental specifications and recurring special provisions.

2. ASTM (American Society of Testing and Materials)

   a. C 88 - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

   b. C 127 - Standard Test Method for Specific Gravity and Absorption of Course Aggregate

   c. C 131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

   d. C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

   e. C 142 - Standard Test Method for Clay Lumps and Friable Particles in Aggregates

   f. D 1140 - Standard Test Method for Amount of Material in Soil Finer than the No. 200 sieve

   g. D 1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort

   h. D 1883 - Standard Test Method for California Bearing Ratio of Laboratory Compacted Soils

   i. D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.3 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 01, and Section 01 33 00.

B. Submit the following not less than 15 days before material is to be delivered.

1. Material Certificates signed by the Material Producer certifying that the following items comply or exceed specifications:

Property	ASTM Test	Data Required
Sieve Analysis for fine and course aggregates	C 136	Percent passing selected sieves
Soundness of aggregates by use of sodium sulfate or magnesium sulfate	C 88	Percent Loss
Atterberg limits	D 4318	Plasticity Index and Liquid Limit
Resistance to degradation of large size coarse aggregate by abrasion and impact in the Los Angeles machine	C 131	Percent Loss
Clay lumps and friable particles in aggregates	C 142	Percent
Crushed faces	--	Percent with one crushed face
Specific gravity	C 127	Specific gravity
Amount of soil finer than No. 200 sieve	D 1140	Percent

2. Submit a 50-pound sample of each grade of material when requested by the OWNER.

1.4 QUALITY ASSURANCE

A. Testing

1. Materials and placing procedures are subject to inspection and testing conducted by an independent testing laboratory paid for by the OWNER.

2. The CONTRACTOR to permit testing laboratory full access to operations, and cooperate fully with the testing laboratory, so the testing laboratory can function properly as specified and required.

PART 2 PRODUCTS

2.1 MATERIALS

A. General Aggregate Requirements: The CONTRACTOR to adhere to the following general and specific aggregate requirements:

1. The material for the base and subbase courses is crushed stone produced from oversized quarried aggregate, sized by crushing and produced from naturally occurring single source.

2. All rock products are clean, hard, sound, durable, uniform in quality, and free of any detrimental quantities of soft, friable, thin, elongated or laminated pieces, disintegrated material, organic matter, oil, alkali, or any other deleterious material.

3. All processing and blending of materials to meet the gradation requirements is performed at the crushing plant or source of material.

4. All percentages specified herein are determined by weight.

B. Dense Graded Base

1. Dense graded base shall be 1¼ -Inch gradation crushed stone in accordance with Section 305.2.2 of the State Specifications.

2. Dense graded base shall be used as base course for concrete pavement and permanent asphalt pavement where indicated on the Existing Typical Sections and per the details shown on the Contract Drawings.

3. The thickness of the dense graded base shall be per the details and/or Existing Typical Sections and per the details shown on the Contract Drawings.

4. The Contractor will have the option of using Crushed Stone, Crushed Gravel, or Crushed Concrete that meets the specified gradation. Reclaimed asphalt, reprocessed material, or blended material will not be acceptable

C. Open Graded Base

1. Open graded base shall be crushed stone with gradation in accordance with Section 310.2 of the State Specifications.

2. Open graded base shall be used as base course for concrete pavement on the Existing Typical Sections on the Contract Drawings.

3. The thickness of the open graded base shall be per the details and/or Existing Typical Sections shown on the Contract Drawings.

D. SAS Geotextile Fabric

1. Geotextile Fabric Type SAS (Subgrade Aggregate Separation) shall be in accordance with Section 645.2.2 of the State Specifications.

E. Aggregate Stone Base Course

1. Conform to Type A as specified in Section 351 of IDOT Standard Specifications, Gradation CA-6.

2. Aggregates meet the quality and gradation requirements as specified in Section 1004 of IDOT Standard Specifications, and as summarized in Table 1A and 1B.

F. Granular Subbase Course

1. Open graded base shall be a mixture of either sand sized particles or sand sized particles mixed with gravel, crushed gravel, or crushed stone with gradation in accordance with Section 350.2 of the State Specifications.

2. Conform to specified in Section 311 of IDOT Standard Specifications, Gradation CA-6 or CA-10.Type A.

3. Aggregates meet the quality and gradation requirements as specified in Section 1004 of IDOT Standard Specifications, and as summarized in Table 1A and 1B.

TABLE 1A

QUALITY REQUIREMENTS FOR AGGREGATE

PROPERTY	BASE COURSE	SUBBASE COURSE
MATERIAL TYPE, GRADATION, & QUALITY CLASS	TYPE A, CA-6, OR CA-10 QUALITY CLASS B	TYPE A, CA-6 OR CA-10, QUALITY CLASS C
PLASTICITY INDEX	0 TO 6	0 TO 9
SODIUM SULFATE SOUNDNESS, % LOSS MAX	15	20
LA ABRASION, % LOSS MAX	40	40
MINUS NO. 200 SIEVE MATERIAL, % MAX	N/A	2.5
TOTAL DELETERIOUS MATERIAL, % MAX	6	10

TABLE 1B COARSE AGGREGATE GRADATIONS		
Sieve Size, Square Openings, Inches	Percent Passing Gradation CA-6	Percent Passing Gradation CA-10
1 ½	100	--
1	90-100	100
¾	--	90-100
½	60-90	65-95
3/8	--	--
No. 4	30-56	40-60
No. 16	10-40	15-45
No. 50	--	--
No. 200(1)	--	2.5

(1) As specified as the maximum percent allowed for the coarse aggregate quality class.

PART 3 EXECUTION

3.1 PREPARATION OF SUBGRADE.

A. General: Prepare Subgrade according to Section 301 of IDOT Standard Specifications and as summarized below. The CONTRACTOR to confirm the following requirements are met:

1. Excavate or fill the subgrade, as required and then grade and compact to provide a firm foundation of uniform density throughout in accordance with the Design Drawings. The upper 12 inches or greater depth if specified on the Design Drawings, is compacted to 95% of the maximum dry density as determined by ASTM D 1557 at optimum moisture content + or – 3%. The CONTRACTOR is to confirm that the completed subgrade is true to alignment, grade and cross section, including required crown.

2. Prior to placement of any fill required to bring subgrade to proper level, strip areas to be covered of any loose or otherwise unapproved fill materials, organic materials, or any foreign or deleterious matter.

3. Fill holes, ruts, and similar defects. Unstable areas, protecting stone or rock, and similar defects is cut out and areas filled with compacted soil.

4. Grade stakes are set and the CONTRACTOR notified of any areas that appear not to drain correctly. Rework of such areas is the CONTRACTOR's responsibility.

B. If the subgrade subsequently loses its density due to exposure to severe weather conditions after having been previously compacted to the required density, the CONTRACTOR is to scarify, wet or dry, the subgrade as required, and compact to the required density.

C. When a sheep foot roller is used to compact the subgrade, the CONTRACTOR is to finish the compaction by either a 3-wheel roller or multiple-wheel rubber-tired roller of sufficient weight to smooth out and compact the indentations made by the sheepsfoot roller.

D. Proof rolling. The CONTRACTOR to confirm that the following proof rolling requirements are met:

1. Proof roll the top surface of the compacted subgrade by making a minimum of two complete coverages with a heavy rubber tired roller.

2. The roller is a gross weight of not less than 25 tons and has not less than 4 pneumatic tire wheels. Under working conditions, the roller delivers a compression of not less than 650 pounds per inch width of tire tread.

3. Two coverages are defined by two applications of one wheel load over each point of the subgrade. The speed of the roller is not less than 2 ½ mph or more than 5 mph. All proof rolling is witnessed by the CONTRACTOR.

4. If under the action of proof rolling the subgrade yields, pumps or otherwise fails, remove the failed area to a minimum depth of 2 ft. and replace with suitable fill compacted as specified in Section and the Design Drawings. The subgrade is considered failed if under the operation of the roller, the surface shows yielding or rutting of more than 2 inches measured from the top of the construction grade to the bottom of the rut.

3.2 PLACEMENT OF SUBBASE COURSE

A. Placement and Compaction: The CONTRACTOR to adhere to the following general and specific placement requirements:

1. General: Place and compact the granular subbase course in accordance with Section 311 of IDOT.

2. The subbase course is placed to the thickness specified on the Design Drawings.

3. Before the material is deposited on the prepared subgrade, it contains the amount of moisture required for compaction. Such moisture is uniformly distributed throughout the material. The water and granular material is mixed at a central mixing plant equipped with a mechanical mixing device and granular material and water measuring devices. Wetting the aggregate by jetting in cars, bins, stockpiles or trucks is not permitted. Moisture may be added to the material during compaction only when necessary to increase the percentage of moisture to obtain satisfactory compaction.

4. The subbase is constructed in layers not more than 6 inches compacted thickness. Spread and Compact each layer in a similar manner.

5. The subbase material is deposited full-width with a mechanical spreader or spreader box in a manner which will not cause segregation and which will require minimum blading or manipulation. The OWNER to approve the equipment and the method used.

6. Each layer is compacted immediately after placing to a density of not less than 95% of the maximum dry density as determined by ASTM D 1557 at a optimum moisture content + or – 2%.

7. Rolling is always commenced along the edge of the road or area to be compacted and gradually advances toward the center of the area to be compacted.

8. Rollers are operated along lines parallel with the centerline of the road being constructed.

9. If any earth is worked into the granular material during the compacting or finishing operations, all granular material within the affected area is removed and replaced with new granular material. The CONTRACTOR may restrict hauling over the completed or partially completed work after inclement weather or at any time when the earth subgrade is soft and there is a tendency for the earth to work into the granular material.

10. If compaction tests indicate that the compacted aggregate does not comply with density requirements, the CONTRACTOR to provide additional wetting or drying, if necessary, and rolling until the specified density is obtained.

11. The CONTRACTOR to place and compact the subbase course a maximum of three days prior to placement of the base course.

B. Protection and Repair

1. The CONTRACTOR is responsible for performing any work necessary to protect the completed subbase course prior to placement of the base course and to perform any work and furnish any materials necessary to repair or restore a completed subbase course damaged by traffic or weather.

3.3 PLACEMENT OF BASE COURSE

A. Placement and Compaction - Adhere to the following general and specific placement requirements:

1. General: Place and compact the aggregate base course in accordance with Section 351 of IDOT Standard Specifications and as summarized below.

2. The base course is placed to the thickness specified on the Design Drawings

3. Verify that the aggregate deposited on the subgrade or the subbase, contains the amount of moisture required for compaction prior to placement. All moisture will be uniformly distributed throughout the material. All water and granular material will be mixed at a central mixing plant equipped with a

mechanical mixing device and granular material and water measuring devices. Wetting the aggregate by jetting in cars, bins, stockpiles or trucks is not permitted. Add moisture to the material during compaction, only when it is necessary to increase the percentage of moisture to obtain satisfactory compaction.

4. The base course is constructed in layers not more than 6 inches compacted thickness. Spread and compact each layer in a similar manner.

5. Deposit the aggregate full-width, directly on the prepared subgrade or subbase, or on the preceding layer of compacted aggregate with a spreader. When placed, is free from segregation and requires minimum blading or manipulation.

6. Immediately after the material has been placed, compact with a tampering roller, or with a pneumatic-tired roller, or with a vibratory machine, or with a combination of any of the three. Give the top layer a final rolling with a three-wheel or tandem roller. Rolling is always commenced along the edge of the road or area to be compacted and gradually advances toward the center of the area to be compacted. The OWNER to approve the manner of compaction.

7. Compact each layer immediately after placing to a density of not less than 95% of the maximum dry density as determined by ASTM D 1557 at an optimum moisture content + or – 2%.

8. If any subgrade material is worked into the base material during the compacting or finishing operations, remove all granular material within the affected area and replaced with new aggregate. The CONTRACTOR may restrict hauling over the completed or partially completed work after inclement weather for at any time when the subgrade is soft and there is tendency for the subgrade material to work into the base material.

9. Compaction tests are performed by the Testing Service on each layer of material. If compaction tests indicate that the compacted aggregate does not comply with density requirements, the CONTRACTOR is to provide additional wetting or drying, if necessary, and rolling until the specified density is obtained.

B. Protection and Repair

1. The CONTRACTOR is responsible to protect the completed base course as required or directed by the ENGINEER and to perform any work and furnish any materials necessary to repair or restore a completed base course damaged by traffic or weather.

3.4 THICKNESS TOLERANCES

A. Thickness determinations are made by the Testing Service, at points selected by the CONTRACTOR or the OWNER. When the average constructed thickness is less than 95% of the thickness specified on the Design Drawings, the CONTRACTOR to add additional aggregate to obtain the required thickness.

3.5 SURFACE TOLERANCES

A. The Testing Service checks for deviations from grades.

B. The CONTRACTOR to confirm that the surface of the top of the base course is smooth on top and within 0.05 ft. of the elevations specified on the Design Drawings, or the elevations of the existing roads that were removed as a part this contract. These elevations were documented prior to removal by the demolition CONTRACTOR and should be provided by the CONTRACTOR.

END OF SECTION

SECTION 32 12 00

ASPHALT PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Furnishing and installing asphalt pavements and solar reflective coatings as indicated on the Drawings.

B. Related Work Specified In Other Sections Includes, But is Not Limited to, the Following:

1. Section 01 11 00 - Summary of Work
2. Section 01 33 00 - Submittals
3. Section 02 41 00 - Demolition
4. Section 02 41 18 - Pavement Removal
5. Section 03 31 00 - Cast-in-Place Concrete
6. Section 31 25 00 - Slope Protection and Erosion Control
7. Section 32 11 23 - Aggregate Base Course and Granular Subbase Course
8. Section 32 13 00 - Concrete Paving
9. IDOT Standard Specifications for Road and Bridge Construction, Latest Edition. "SSRBC". This work shall be performed in accordance with the applicable portions of the Standard Specifications, Sections 301, 353, 406 and 420". Articles of the Standard Specifications covering "Method of Measurement" and "Basis of Payment" are not applicable.

1.2 REFERENCES

A. IDOT Standard Specifications for Road and Bridge Construction, Latest Edition. "Standard Specifications".

1.3 SUBMITTALS

A. Submit proposed mix design to the ENGINEER for approval prior to beginning of Work.

B. Submit material certificates signed by material producer and CONTRACTOR, certifying that each material item is from an IDOT approved source.

1.4 SPECIAL REQUIREMENTS

A. Reference Standards - The work is subject to the requirements of applicable portions of Section 406 (Binder and Surface Courses), Section 442 (Pavement Patching),

Section 1030 and other articles referenced within Sections, 406, 442, 1030 or other Sections or Articles cited elsewhere in this Specifications and the following:

1. "Standard Specifications for Road and Bridge Construction" prepared by the Illinois Department of Transportation, latest edition, and the supplemental Specifications and recurring special provisions (separate book). The "Standard Specifications for Road and Bridge Construction" is referred to in the following Articles as the "SSRBC" and except as may be otherwise stated, the work to be done under this Section must conform to the requirements of said "Standard Specifications."

2. Standard Specifications articles referring to "Method of Measurement' and Basis of Payment" are not applicable.

3. Asphalt plants must meet the requirements of SSRBC Article 1102.01 for hot-mix asphalt (HMA) inclusive of policy memoranda and permissive use per mix Class I or otherwise.

1.5 WARRANTIES AND GUARANTEES

A. Provide one (1) year warranty or manufacturer's standard warranty, whichever is longer. Warranty period will begin as defined in Specifications Book 1 – Terms and Conditions for Construction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Use locally available materials from IDOT approved sources.

B. Bituminous Concrete Paving must be Class I, Type 2, as specified in Section 406 of SSRBC.

C. Prime coat must be liquid asphalt, Type MC-30 conforming to Section 406 of SSRBC.

D. Solar Reflective Asphalt Coating: Provide asphalt coating confirming to the requirements specified as follows:

1. Epoxy-modified, acrylic, waterborne coating specifically designed for application on asphalt pavements

2. Independently verified to have an SRI greater than 29

3. When tested for adhesion to asphalt per ASTM D-4541, substrate failure results.

E. Mixture for the Bituminous Concrete Paving Surface Course must be “IL-9.5, Mix D” and the Bituminous Concrete Paving Binder must be “IL-19”.

PART 3 EXECUTION

3.1 INSPECTION

A. Before placing asphalt pavement, examine substrate surfaces to determine that they are free of conditions which might be detrimental to proper and timely completion of the work. Start of work must indicate acceptance of the substrate.

3.2 SURFACE PREPARATION

A. Bituminous concrete pavement must be installed in accordance with Sections 301 and 406 of SSRBC.

B. When required, remove existing pavement by saw, pneumatic hammer or wheel, cutting edges of the existing roadway. After the Aggregate Base Course is shaped and compacted, place the type of pavement as required in these Specifications to match existing pavement as shown on the Drawings.

C. Pavement removal shall be extended to a seam or joint if seam or joint is within 3 feet of damaged or cut pavement.

D. Compact subgrade to 95 percent of maximum density as defined by ASTM D1557, as specified in Specification Section 31 23 23. Compacted subgrade must be a minimum of 12 inches in depth.

E. Spread and compact coarse aggregate base course material over prepared subgrade. Placement and compaction must be in conformance with Section 212 of SSRBC. Compacted base course must be a minimum of 10 inches in depth.

F. Remove loose material from compacted aggregate base course surface immediately before applying prime coat.

G. Proof-roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

H. Notify ENGINEER of unsatisfactory conditions. Do not begin paving Work until deficient subbase areas have been corrected and are ready to receive paving.

I. Prime Coat: Primer must be prepared and applied as specified in Section 406 of the SSRBC. Apply at rate of 0.25 to 0.50 gal. per sq. yd., over compacted aggregate base course. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatiles.

J. Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into hot-mixed asphalt pavement. Distribute at rate of 0.05 to 0.15 gal. per sq. yd. of surface.

K. Allow to dry until at proper condition to receive paving.

L. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Clean damaged surfaces.

3.2 PLACING MIX

A. Place hot-mixed asphalt mixture on prepared surface, spread, and strike off. Spread mixture at minimum temperature of 250 degrees Fahrenheit. Place areas inaccessible to equipment by hand. Place each course to required grade, cross-section, and compacted thickness.

B. Placement and compaction must be in accordance with Section 406 of SSRBC. The paving must be maintained until overlaid with a wearing course, thickness as indicated on Drawings. Compacted surface course must be a minimum of 1-1/2 inches in depth. This minimum thickness must also apply to areas requiring resurfacing. Place in strips not less than 10 feet wide, unless otherwise acceptable to the ENGINEER. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

C. Immediately correct surface irregularities in finish course behind paver. Remove excess material forming high spots with shovel or lute.

D. Make joints between old and new pavements, or between successive day's Work, to ensure continuous bond between adjoining Work. Construct joints to have same texture, density, and smoothness as other sections of hot-mixed asphalt course. Clean contact surfaces and apply tack coat.

3.3 ROLLING

A. Begin rolling when mixture will bear roller weight without excessive displacement.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling, if required, with hot material.

D. Perform breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been evenly compacted.

E. Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained 95 percent laboratory density.

F. Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot hot-mixed asphalt. Compact by rolling to specified surface density and smoothness.

G. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough to not become marked.

3.4 TACK COAT

A. All work shall be in accordance with the Standard Specifications.

B. If asphaltic upper layer is applied to an existing street or is not applied the same day as lower layer, the existing street or lower layer shall be tack coated prior to surface paving. Prior to placement of tack coat, the streets shall be thoroughly cleaned and broomed. Tack coat shall be applied at a rate of 0.10 gallons per square yard immediately prior to placement of asphaltic upper layer.

C. In situations where traffic must be maintained, tack coat shall not be placed on the traveled half of the street until traffic can be switched to the new pavement.

3.5 JOINTS

A. Joints between old and new pavements or between successive day's work shall be constructed and treated as to insure thorough and continuous bond between the old and new mixtures. Transverse construction joints shall be constructed by cutting the material back for its full depth so as to expose the full depth of the course. Where a header is used, the cutting may be omitted provided the joint conforms to the specified thickness. These joints shall be treated with tack coat material applied with a hose and spray nozzle attachment to fully coat the joint surface.

B. The longitudinal joint shall be made by overlapping the screed on the previously laid material for a width of not more than 2 inches and depositing a sufficient amount of asphaltic mixture so that the finished joint will be smooth and tight. Longitudinal joints in the upper layer shall at no time be placed immediately over similar joints in the lower layer beneath. A minimum distance of 12 inches shall be permitted between the location of the joints in the lower layer and the location of similar joints in the upper layer above.

C. All costs for furnishing and applying tack coat to butt joints as specified above shall be considered incidental.

3.6 FINISHING ROADWAY

A. The finished base course shall be fine-graded in preparation for HMA paving. Base course ramps at all existing pavement shall be removed to provide a full depth butt joint. Base course around manhole castings and valve boxes shall be hand-trimmed and compacted with a vibratory plate compactor.

B. This item shall include all of the following preparatory and finishing items and any other incidental items of work required for construction. Asphaltic ramps around manholes on existing lower layer to receive upper layer shall be removed. Asphaltic ramps shall be installed on all manholes and at all butt joints in areas to receive lower layer only.

C. Finishing roadway shall be considered incidental to HMA paving.

D. Paint all markings as shown on drawings with lines not less than 4 inches wide

3.7 FIELD QUALITY CONTROL

A. Comply with SSRBC, Section 406.

B. Comply with all the requirements of the Illinois Accessibility Code, including but not limited to slopes, smoothness and changes in elevation.

C. Testing in-place hot-mixed asphalt courses for compliance with requirements for thickness and surface smoothness will be done by ENGINEER's testing laboratory. Repair or remove and replace unacceptable paving as directed by ENGINEER.

D. In-place compacted thickness tested in accordance with ASTM D 3549 will not be acceptable if exceeding following allowable variations:

1. Base course must be plus or minus 1/2 inch.
2. Surface course must be plus or minus 1/4 inch.

E. Test finished surface of each hot-mixed asphalt course for smoothness, using a 10-foot straightedge applied parallel with and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.

1. Base course surface must be within 1/4 inch.
2. Wearing course surface must be within 3/16 inch.

F. Check surface areas at intervals as directed by ENGINEER.

G. The Contractor must maintain pavement under this Contract during the guarantee period of one year and must promptly (within 3 days of notice given by the ENGINEER) refill and repave areas which have settled or are otherwise unsatisfactory for traffic.

H. No vehicular traffic or loads must be permitted on the newly completed pavement until adequate stability has been attained and the material has cooled sufficiently to prevent distortion or loss of fines. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the ENGINEER. Any damaged areas will need to repair the pavement per the contract document and to the satisfaction of the ENGINEER, at no additional cost to the City.

3.8 SOLAR REFLECTIVE ASPHALT COATINGS

A. Prepare substrate and apply top-coat as recommended by manufacturer.

B. Apply in layers and to thickness recommended by manufacturer for services condition of up to 500 vehicles per day. Provide additional layer and build thickness in high wear areas such as entrances and turning areas.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 32 13 00

CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Furnishing and installing complete concrete curbs and gutters and pavements as indicated on the Drawings.

B. Related Work Specified In Other Sections Includes, But is Not Limited to, the Following:

1. Section 02 41 18 - Pavement Removal
2. Section 03 31 00 - Cast-in-Place Concrete
3. Section 31 23 16 - Excavation Earth and Rock
4. Section 31 25 00 - Slope Protection and Erosion Control
5. Section 32 11 23 - Aggregate Base Course and Granular Subbase Courses
6. Section 32 12 00 - Asphalt Paving
7. IDOT Standard Specifications for Road and Bridge Construction, Latest Edition. "Standard Specifications". This work shall be performed in accordance with the applicable portions of the Standard Specifications, Sections 353, 406 and 420". Articles of the Standard Specifications covering "Method of Measurement" and "Basis of Payment" are not applicable.

C. Comply with the "American Iron and Steel (AIS)" requirements as contained in Section 436 of the Consolidated Appropriations Act, 2014, further described in Section 00 08 00 Compliance with Iron and Steel Requirements.

1.2 REFERENCES

A. IDOT Standard Specifications for Road and Bridge Construction, Latest Edition. "Standard Specifications".

1.3 SUBMITTALS

A. Submit proposed mix design to the ENGINEER for approval prior to beginning of Work.

B. Submit the following:

1. Test Reports

a. Submit test reports necessary to show compliance with the Contract Documents.

b. The CONTRACTOR provided Quality Control Certified Technicians which must make tests and perform inspection in accordance with these Specifications, at no cost to the ENGINEER including:

(1) Laboratory Test Report
(2) Batch Plant Inspection Report

2. Manufacturer's Certification

a. Submit certification that products meet or exceed the specified requirements.

b. Previous acceptance of mix design in the last 6 months by IDOT or City of Chicago for similar applications.

1.4 QUALITY CONTROL

A. Concrete Quality:

1. No concrete must be placed until mix designs and 3 & 14 day test results are submitted by the CONTRACTOR and accepted by the ENGINEER.

2. The adequacy of a design must be verified by QC tests on a minimum of 5 cylinders; 2 tested at 7 days and 2 at 14 days, and 1 reserve, in accordance with ASTMC 192 and C-39; by slump test for the first two loads, the last load, every 50 cubic yards, and every time cylinder samples are taken in accordance with ASTM C 143, air test for the first two loads, the last load, every 50 cubic yards, and every time cylinder samples are taken in accordance with ASTM C 231, and temperature test for the first two loads, the last load, every 50 cubic yards, and every time cylinder samples are taken in accordance with ASTM C 1064. The number of tests required must be one (1) set of specimens for each day's placement of each 50 cu yards of concrete, or fraction thereof. The CONTRACTOR must make and initially cure and store the test specimens in accordance with ASTM C31. The CONTRACTOR's technician preparing the specimens must be currently certified to perform the required concrete sampling and testing. CONTRACTOR is responsible for all sampling, testing and laboratory engagement. CONTRACTOR must provide initial curing facilities of all test samples. Initial environment to meet ASTM C 31.

3. If at anytime during construction the concrete resulting from the approved mix design proves to be unsatisfactory for any reason, such as lack of workability, of insufficient strength, the CONTRACTOR must immediately notify the ENGINEER. The concrete supplier must verify the deficiency with additional testing and modify the design, subject to the ENGINEER's approval, until a satisfactory concrete mix is obtained.

4. Strength requirements of concrete must be as noted on the Drawings. Concrete must be proportioned to achieve an average strength of 500 psi higher than design strength shown on the drawings. If no design strength is shown, the design strength of the concrete must be 3500 psi at 14 days.

5. In cases where 14 day strength of cylinders falls below 3500 psi, the required strength, the ENGINEER will have the right to require core tests to be made on portions of concrete poured represented by the cylinders, at the CONTRACTOR's expense. Any portion of concrete work failing to meet required core tests must be removed and replaced with satisfactory work at no additional cost to the City. In all cases where strength of the laboratory control cylinders, shown by these tests for any portion of concrete poured falls below the minimum ultimate compressive strengths specified, the ENGINEER will have the right to order a change in mix or in water content for remaining portions of pavement and to require conditions of temperature and moisture necessary to secure required strengths.

6. When an approved water reducing admixture is used in accordance with manufacturer's recommendations, cement requirements may be reduced. Mix designs must indicate use of admixtures.

7. Slump must be in accordance with Standard Specifications Section 415. The testing laboratory retained by the CONTRACTOR will have the right to reject any concrete which arrives at job site in excess of specified slump. No water will be added to design mix unless as directed in writing by ENGINEER's representative. Slump must be determined in accordance with ASTM C 143.

8. All concrete exposed to weather or in contact with earth or backfill must be air-entrained. Air-entrained concrete must be made with an air-entraining admixture. Air content must be within limits of 5 to 8 percent, net at time of placement. Air content must be determined in accordance with ASTM C 231.

9. Minimum cement content for PCC pavement must be 535 pounds per cu. yd. of central mixed concrete. Fine aggregate will not be less than 1/3, not more than ½ of total aggregate.

10. A plasticizing admixture may be used when approved by the ENGINEER for the purpose of reducing water requirements for a given consistency and strength of concrete and for increasing workability. Mixture must be used in accordance with manufacturer’s recommendations. A maximum reduction in cement content of ½ sack of cement per cubic yard may be made, provided all other requirements are met.

11. The temperature of the mixed concrete must not be less than 50 degrees F and not more than 90 degrees F at the time of placement. Temperature must be determined in accordance with ASTM C 1064.

B. Perform Work in accordance with the latest edition, of the appropriate divisions, of the following:

1. ACI 311.1R "ACI Manual of Concrete Inspection"

2. ACI 304R "Guide for Measuring, Mixing, Transporting and Placing Concrete", except minimum cement content must be herein specified

3. CSI "Manual of Standard Practice"

4. ACI 318 "Building Code Requirements for Structural Concrete"

5. ASTM C 94 "Specifications for Ready Mixed Concrete"

6. ACI 305R "Hot Weather Concreting"

7. ACI 306R "Cold Weather Concreting"

8. ACI 308R “Guide to Curing Concrete”

9. ACI 309R “Guide to Consolidation of Concrete”

10. ACI 347 “Guide to Formwork for Concrete”

11. "Standard Specifications for Road and Bridge Construction" prepared by the Illinois Department of Transportation latest edition is a separate book. The "Standard Specifications for Road and Bridge Construction" is referred to in the following articles as the Standard Specifications and except as may be otherwise stated, the work to be done under this Section must conform to the requirements of said Standard Specifications. CONTRACTOR's field office and laboratory is not a requirement.

    a. Where the "Standard Specification" refers to the "ENGINEER”, it must be understood to mean "ENGINEER”, except in cases where it is deemed to be QC testing by the CONTRACTOR.

    b. Unless otherwise noted on Drawings or specified, the applicable articles of the following Sections of the Standard Specifications must govern:

    c. Sections 420, 423, 424, and 606.
    (Note: Articles of the Standard Specifications covering method of measurement and basis of payment are not applicable.)

1.5 SPECIAL REQUIREMENTS

A. Temperatures

1. When hot weather conditions as defined in ACI 305 exist, place and cure concrete in accordance with same.

2. When cold weather conditions as defined in ACI 306 exist, place and cure concrete in accordance with requirements of same.

PART 2 PRODUCTS

2.1 CONCRETE MIX DESIGN

A. Concrete Pavements and driveways shall be IDOT Class PV concrete pavement per Article 1020.04 of the SSRBC.

B. Concrete sidewalks, medians and curb and gutter shall be IDOT Class SI concrete pavement per Article 1020.04 of the SSRBC.

2.2 MATERIALS

A. Portland Cement - ASTM C 150, Type I cement as approved by the ENGINEER.

B. Fly Ash - ASTM C 618 and Section 501.2.6 of the State Specifications.

C. Concrete Curb and Gutter

1. Concrete curb and gutter shall consist of Portland Cement Concrete conforming to Section 606 of the State Specifications and the Standard Detail Drawings shown on the Contract Drawings.

D. Aggregate for Normal Weight Concrete - All fine and coarse aggregate must conform to IDOT SSRBC Articles 1003.02 and 1004.02, respectively, in accordance with Section 501 of the State Specifications. The amounts of deleterious substances present in the fine and course aggregate expressed in percentages by weight shall not exceed the following:

1. Material classified as chert and having a bulk specific gravity of less than 2.45. The percentage of chert shall be determined on the basis of the weight of chert in the sample retained on a 3/8-inch sieve divided by the weight of the total sample.

E. Water - Clean, fresh, potable.

F. Steel Concrete Reinforcement in accordance with Section 508 of the State Specifications.

G. Admixtures - Concrete admixtures must comply with ASTM C 494 (Water reducing) or ASTM C 260 (Air Entraining), produced by recognized manufacturers subject to ENGINEER's approval.

1. Air Entraining Admixture – Provide in accordance with Section 1021 of the State Specifications.

2. Water Reducing Admixture - ASTM C 494, Type A, and not containing any; chloride ions added during manufacture, "Eucon WR-75" (The Euclid Chemical Company); "Pozzolith" 122N (Master Builders); "WRDA with Hycol" (W.R. Grace & Co.); "Plastocrete" (Sika Chemical Company).

3. Water Reducing, Retarding Admixture - ASTM C 494, Type D. When high temperatures, placing or humidity conditions dictate, "Eucon Retarder-75" (The Euclid Chemical Company); "Pozzolith 100-XR" (Master Builders); "Daratard HC" (W.R. Grace & Co.); "Plastiment" (Sika Chemical Company).

4. Plasticizing Admixture - "Pozzolith-N" (Master Builders)- "WRDA" (W.R. Grace & Co.)¬; 'Plastiment" (Sika Chemical Company). When ambient temperature is expected to exceed 80 degrees F during placing and finishing operations, use "Pozzolith - R" (Master Builders); "Daratard" (W.R. Grace & Co.).

5. Calcium chloride must not be used.

H. Bonding Agent - Epoxy type, 100 per cent solids "Euco Epoxy #452 (dry surface), #463" (dry or damp surface), (The Euclid Chemical Company); "Sikadur Hi-Mod" (dry or damp surface) (Sika Chemical Co.); "Duralbond 102" (dry or damp surface), (Dural International Corp.).

I. Patching and Surfacing Compound - Epoxy type, 1 00 per cent solids, "Euco Epoxy #456 Mortar (dry surface), #460 (dry or damp surface)", (The Euclid Chemical Company); "Sikadur Lo-Mod Mortar" (dry or damp surface) (Sika Chemical Co.); "Duraltex" (dry or damp surface), (Dural International Corp.).

J. Form Material - Provide metal or wood templates and forms conforming to profiles, lines and dimensions as shown, of substantial design and construction to maintain position and shape when concrete is placed. All forms must be subject to the acceptance of the ENGINEER.

K. Protective Coating – Boiled linseed oil protective coat shall meet the requirements of AASHTO M 233, except the protective coat shall have a nonvolatile range of 53 to 57 percent and the petroleum spirits used in the production of the protective coat shall be Type I meeting the requirements of ASTM D 235 with a maximum copper corrosion rating of 2.

L. Form Oil - Suitable for the type of forms used and the conditions of use.

M. Pavement and Curb Expansion Joint Filler - Bituminous preformed joint filler for expansion joints must conform to the requirements of Article 1051.03 of Standard Specifications and must be punched to admit the dowels where called for on plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the ENGINEER. "Asphalt Expansion Joint Filler" W.R. Meadows, J D Russell Company or Atlas Construction Supply. Expansion Joint must be full depth of joint.

N. Construction Joints - Between all concrete pours suspended for thirty (30) minutes or more, must be a construction joint as shown and detailed on the Drawings.

O. Curing Materials

1. Absorptive Cover - Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with ASSHO M 182, Class 3 or cotton mats complying with ASTM C 440.

2. Moisture-Retaining Cover - One of the following:

   a. Waterproof Paper - ASTM C 171, Type 1 or Type 11.

   b. Polyethylene Sheeting - AASHO M 171.

   c. Polyethylene-coated burlap.

3. Liquid Membrane Curing Compound - ASTM C 309, Type 1, resin type, clear, unless otherwise directed, for vertical and horizontal surfaces, "Horn Clear-Seal" (W. R. Grace & Co.); "Acri Seal S" Toch Brothers Division, (Carboline Company); "Kure-N-Seal" (Sonneborn-Contech).

2.3 MIXING CONCRETE

A. Concrete for this Project must be ready-mix concrete; must be batched and delivered from a plant approved by the ENGINEER and in strict accordance with the requirements set forth in ASTM C 94, subject to all provisions specified herein regarding materials, strength, proportioning, consistency and delivery time. Additional amounts of water to the batch, either at the plant or at the Job site will not be permitted, except upon specific approval of the ENGINEER in each instance and only if confirmed by calculations utilizing batch weights performed by the CONTRACTOR's QC laboratory to not exceed the design water to cement ratio.

B. The rate of delivery of the ready mixed concrete must be such that the interval between placing of successive batches must be 30 minutes or less to prevent "cold joints". The elapsed time between the introduction of mixing water to the cement and aggregate and completion of discharge must not exceed one (1) hour.

C. Minimum mixing for each batch must be that required to produce a uniform mixture of materials but in no case less than 70 revolutions after all materials are in the mixer, including water.

D. The ready-mixed concrete producer must submit duplicate delivery tickets, one (1) for the CONTRACTOR and one (1) for the ENGINEER, with each load of concrete delivered to the job. Delivery tickets must provide the following information:

1. Date
2. Name of ready-mix concrete plant
3. CONTRACTOR
4. Job Location
5. Type (Standard or High Early Strength) and brand of cement
6. Cement content in bags per cubic yard of cement
7. Truck number

8. Time dispatched and time unloaded
9. Admixtures in concrete, if any
10. Type and maximum size of aggregate
11. Water added at job, if any
12. Name of person who authorized addition of water

E. Close control of mixing time must be maintained for air-.entrained concrete.

F. The testing laboratory engaged by the CONTRACTOR's Q.C. personnel must periodically check batch proportions and yield strength, and must have continuous access to the mixer.

PART 3 EXECUTION

3.1 GENERAL

A. All materials shall be installed shall be in accordance with the State Specifications unless otherwise noted.

3.2 INSPECTION

A. Before pouring concrete, examine substrate surfaces to determine that they are free of conditions which might be detrimental to proper and timely completion of the work. Start of work must indicate acceptance of the substrate

3.3 PREPARATION

A. Sub-grade and sub-base - Before proceeding with the installation of paving or concrete work, the CONTRACTOR must carefully examine the sub-base and must perform any minor grading, shaping, filling or other preparatory work required in the opinion of the testing laboratory or the ENGINEER prior to placing the base course. Building up of sub-grade under forms after they are in place will not be permitted.

3.4 PLACING CONCRETE

A. In no case will concrete be placed upon frozen base course or subgrade material. Discontinue concrete operations when the air temperature is expected to fall below 40 degrees F during the 24 hour period after placing concrete or when the air temperature is likely to remain below 30 degrees F during the succeeding 6 days; unless provisions for heating aggregates, sand and water have been made, the CONTRACTOR has submitted a Cold Weather Paving Plan, and the methods proposed for protecting the concrete has been approved by the ENGINEER. In such cases, provide heated concrete in accordance with ASTM C 94 and follow procedures as outlined in ACI 306R "Cold Weather Concreting".

B. Accelerating or antifreeze admixtures must not be used. The CONTRACTOR is responsible for the protection of finished concrete against all damage or injury, including freezing until the work has been completed and accepted. The CONTRACTOR will be held responsible for any defective work resulting from

freezing or damage in any manner during placing and curing, and must replace such work at his or her expense.

C. Concrete consolidation must be performed in accordance with ACI 309R "Guide for Consolidation of Concrete".

3.5 CONCRETE PAVEMENT - CURBS - GUTTERS

A. Construct all concrete pavements, curbs, etc., indicated on the Drawings, to the lines, grades and Sections indicated. Concrete must be proportioned and mixed as specified, strengths as scheduled. Air entraining must be incorporated in the mix by adding an approved admixtures air content of concrete must be within limits of 5% to 8% net at time of placement, in accordance with ASTM C 231.

B. Unless otherwise indicated or noted on Drawings, lay out pavements into Sections not exceeding 20 feet in length, separated by expansion joints extending full depth of slab. Unless otherwise shown, expansion filler must be 3/4 inch thick, of material as specified.

C. Unless otherwise indicated or noted on Drawings, expansion joints in curbs must be spaced not more than 60 feet on centers. Unless otherwise shown, joints must be 3/4 inch thick.

D. Pitch work as indicated on the Drawings for drainage, approximately 1/8 inch per foot, or as required between the new work and existing work to remain, to assure an even transition is made. Level off slabs with strike-off rod and finish to true and even surface with floats and trowel, leaving a smooth surface. After the water sheen has disappeared, the surface must be given a final finish by brushing with a brush drawn across the surface at right angles to the edges of the walk, with adjacent strokes slightly overlapping, producing a uniform, slightly roughened surface with parallel brush strokes. Wheel chair ramps must be similarly finished, except for heavier brooming transverse to slope of ramps.

E. Forms for concrete curbs and combination concrete curbs and gutters must be removed within 24 hours after the concrete has been placed. Minor defects must be filled with mortar composed of one part Portland cement and two parts of fine aggregate. The exposed surfaces must be finished smooth and given a light brush finish, while the concrete is still green. The edges must be rounded with approved finishing tools having the radii shown on the Drawings.

F. After the concrete has set sufficiently, the spaces in back of the curb or combination curb and gutter must be backfilled to the required elevation with approved material which must be compacted until firm and solid and neatly graded.

G. Traffic, loading or backfilling must not be allowed on concrete surfaces for 7 days after the concrete has been placed or until 75% of design strength is achieved. If the CONTRACTOR seeks permission from the ENGINEER to place traffic, loads, or to backfill before 7 days, the CONTRACTOR QC and his laboratory must make and break additional cylinders for this purpose in the CONTRACTOR's approved laboratory, subject to verification by the ENGINEER. Any damaged areas will need to

repair the pavement per the contract document and to the satisfaction of the ENGINEER, at no additional cost to the City.

3.6 CURING AND PROTECTION

A. Protect freshly placed concrete from defacement, premature drying and excessive cold or hot temperature, and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

C. Begin final curing procedures immediately following initial curing and before concrete has dried. Provide continuous moist curing above 50 degrees F for at least 7 days, regardless of ambient air temperatures. Demonstrate to the ENGINEER that temperature is maintained by means of a high-low or recording thermometer. Continue final curing for at least 168 hours (7 days).

D. Cure concrete in accordance with ACI 308R “Guide to Curing Concrete”.

E. Concrete must be cured by one of the following methods or by combinations thereof, as approved:

1. Moisture Curing - Cover concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers. At the CONTRACTOR's option, moisture curing may also be provided by ponding or continuous water spraying, where approved by the ENGINEER.

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 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Membrane Curing - Apply membrane-forming curing compound to damp concrete surfaces as soon as water film as disappeared and surface is hard enough to carry applicator's weight without damage. Apply uniformly in 2 - coat continuous operation by power-spray equipment in accordance with manufacturer's directions. Maintain continuity of coating and repair all damage during curing period.

F. Unless otherwise specified herein or as directed by the ENGINEER, Moisture curing or a combination of moisture curing and moisture retaining cover curing must be employed for all exterior concrete pavement work which is to receive a "Surface Sealer”.

3.7 SURFACE SEALER

A. All concrete pavements, curbs and gutters must be cured in accordance with Section 1022 of Illinois Department of Transportation Standard Specifications for Road and Bridge Construction latest edition. All exterior concrete placed after October 1, which may be subject to deicing chemicals must be protected with a two-coat application of boiled linseed oil as described in Section 420.18 of SSRBC.

B. Pavement, curbs and gutters poured before October 1, will not require a linseed oil sealer.

3.8 HOT AND COLD WEATHER CONCRETING

A. The CONTRACTOR must submit detailed procedures for production, transportation, placement, protection, curing, testing and temperature monitoring of concrete during hot or cold weather. The Hot or Cold Weather Concreting Plan must include procedures to be implemented upon abrupt changes in weather conditions or equipment failures.

3.9 CLEAN-UP

A. All rubbish and debris resulting from the work of this Section must be collected, removed from the site and disposed of legally.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 33 05 13

SANITARY AND STORM SEWER MANHOLES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for providing sanitary and storm sewer manholes and all other appurtenances for a complete installation. Provide manholes built in accordance with the details shown and City of Evanston requirements. Except as otherwise specified, construct sewer manholes of precast reinforced concrete sections conforming to ASTM C 478 and Standard Specifications for Water and Sewer Main Construction in Illinois except as otherwise indicated.

B. Related Work Specified in Other Sections Include, But is Not Limited to, the Following:

1. Section 01 33 00 - Submittals
2. Section 03 20 00 - Concrete Reinforcing
3. Section 03 31 00 - Cast-in-Place Concrete
4. Section 09 96 00 - High Performance Coatings
5. Section 31 23 16 - Excavation - Earth and Rock
6. Section 31 23 23 - Backfilling
7. Section 31 41 00 - Shoring, Sheeting and Bracing

1.2 REFERENCE

A. Codes and standards referred to in this Section are:

1. ASTM A 48 - Specifications for Gray Cast Iron Castings

2. ASTM C 32 - Specification for Sewer and Manhole Brick (Made for Clay or Shale)

3. ASTM C 443 - Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets

4. ASTM C 478 - Specification for Precast Reinforced Concrete Manhole Sections

5. ASTM C497 - Testing Concrete Pipe

6. ASTM A185 - Wire Fabric Reinforcement

7. ASTM C 76 - Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

8. ASTM C 877 - Specification for External Sealing Wrap at all Joints Between Pre-Cast Manhole Sections

9. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures

10. ASTM C 923 - Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes

11. ASTM C 990 - Standard Specifications for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants, Section 6.2 Butyl Rubber Sealants

12. Illinois Sewer and Water Specifications, latest edition

1.3 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1, Section 01 33 00.

B. Shop Drawings: Submit shop drawings of sewer manholes as specified in Division 1.

C. Quality Control: Submit shop and field test reports of concrete samples tested in an approved laboratory.

1.4 DELIVERY, STORAGE AND HANDLING

A. General: Take every precaution to prevent injury to the manhole sections during transportation and unloading. Unload manhole sections using skids, pipe hooks, rope slings, or suitable power equipment, if necessary, and keep the sections under control at all times. Do not allow the manhole sections to be dropped, dumped or dragged under any conditions. Follow applicable requirements specified in Division 1.

B. Damaged Section: If any manhole section is damaged in the process of transportation or handling, reject and immediately remove such sections from the site, and replace the damaged manhole sections at no increase in Contract Amount.

PART 2 PRODUCTS

2.1 PRECAST MANHOLES

A. Provide precast concrete manhole sections, including bottom and top meeting the requirements of ASTM C478 and Part III of the Illinois Sewer and Water Specifications except as otherwise indicated.

B. Manhole Base Section: Unless otherwise shown, provide manhole base sections consisting of a base riser section with an integral floor. When benches are made at the manufacturing site, provide concrete used for benched inverts conforming to the requirements for concrete used for precast sections. When benches are made in the field, Class D concrete may be used.

C. Preformed Joints: Join riser, cone and flat slab top sections with joints filled with preformed joint sealing compound in accordance with the sealing compound manufacturer's recommendations, except that install sufficient sealing compound so as to completely fill the joint and show a "squeeze-out" on the inside and outside of the joint. Clean off all excess joint sealing compound from the inside surfaces.

D. Provide manhole top sections with precast reinforced eccentric cones unless precast reinforced flat slabs are specifically required or shown on the Drawings or are necessary because of shallow depth. Provide flat slabs with opening offset unless otherwise required or shown. Design flat slabs for HS20 loadings.

E. Nominal diameter of Sectional Vaults and Manholes unless shown otherwise on Contract Drawings:

1. 4 feet - 0 inch: Pipes equal to or less than 21 inches nominal diameter

2. 5 feet - 0 inch: Pipes larger than 21 inches nominal diameter through 42 inches inclusive.

3. 6 feet - 0 inch: Pipes larger than 42 inches nominal diameter and where shown on drawings.

4. Wall Thickness of sectional Vaults and Manholes:

Diameter	Wall Thickness
4 ft. - 0 in.	5 in.
5 ft. - 0 in.	6 in.
6 ft. - 0 in	7 in.

F. Openings for Pipes in Sanitary Manhole Riser Sections (either pre cast or core drilled): provide crown of opening 12 inches from the top of the section and the invert of the opening 12 inches from the bottom of the section.

G. No through wall lifting holes are permitted in base section, riser sections, and eccentric cone section for sanitary manholes.

H. Seal lifting holes with rubber plug or equal and cover with non-shrink grout on interior face of wall.

2.2 MANHOLE FRAMES AND COVERS:

A. Manufacturer:

1. Neenah Foundry Co.

2. East Jordan Iron

3. Substitutions: Specified in Section 01 60 00 - Product Requirements.

B. Provide manhole frame and cover as shown.

C. Sanitary sewer manholes: Cast iron frame and solid lid with concealed pickhole and watertight gasket.

1. Frame: Cat # R-1661 (Neenah). Cover: Cat # R-1660 Type C (Neenah).

D. Storm sewer manhole, catch basins and inlets:

1. Refer to Drawings.

2. Mark all grates “NO DUMPING - DRAINS TO RIVER”

E. Provide castings with heavy duty iron conforming to ASTM A48, Class 20 and rated for AASHTO H-20 loading. Provide non-rocking or machined castings with concealed pickhole.

F. Provide manhole covers with the words “City of Evanston” “D.P.W.” in 1-inch letters cast in the center.

G. Provide potable water vault covers with the words “WATER” cast in the center.

H. Frames and Covers furnished are to provide hydraulic capacity, interior clearance dimensions, approximate vertical height, and as shown on the drawing.

2.3 MANHOLE JOINT MATERIALS

A. Flexible Joint Sealant: Seal the joints and/or joint surfaces of the manhole sections with a butyl-rubber-based performed flexible sealant conforming to ASTM C-990, paragraph 6-2. Size the sealant such that the joint is filled to 50% (minimum) of its annular volume when fully assembled. Butt the ends of the sealant together. Primer

and/or adhesive as recommended by the sealant supplier. Provide each joint with a double layer of sealant.

1. Butyl Rubber (Hydrocarbon Content %): Minimum 58%

2. Manufacturer: EZ Stick, Press-Seal Gasket Corporation, or equal.

B. External Joint Seals: Install all manhole section joints with an exterior joint collar. Provide the joint collar of a band 9 inches wide. Provide the band with an outer layer of polyethylene with an under layer of rubberized mastic that is reinforced with a woven polypropylene fabric. Provide a peelable protective paper against the mastic that is removed when the collar is applied to the joint. Within the collar, provide two heavy 5/8 inch steel straps located 3/4 inches from each edge of the band. Provide the straps in strap sheathing that isolate them from the mastic sealer and allow them to slide freely when tightened around the sections. Design the collar so that when it is applied around the joint the ends overlap at least 6 inches. After removing the protective paper, the band is to be placed around the sections. Secure the steel straps with the proper tools. The ends are to cover the remaining exposed straps.

1. Manufacturers: Cretex Wrap, Mac Wrap.

2.4 MANHOLE CONNECTORS:

A. Provide resilient connectors conforming to ASTM C 923 for joining sewers to manhole riser sections.

B. Provide a flexible pipe-to-manhole connector integrally cast into the structure. The connector is to assure a flexible watertight seal between the pipe and the manhole. Provide the connector consisting of an EPDM or synthetic or natural rubber gasket and two (2) external 304 stainless steel take-up clamps.

C. For Penetrations Core Drilled through Manhole Wall: Install a flexible pipe-to-manhole connector perpendicular to the core drilled hole. The connector assembly is to assure a flexible watertight seal between the pipe and the manhole. The connector is to consist of a rubber gasket, an expansion sleeve or band, and two external take-up clamps. Provide EPDM or synthetic or natural rubber gasket. Provide the band, sleeve, clamps and hardware of Series 300 stainless steel. Provide the connector meeting or exceeding the requirements of ASTM C- 923

2.5 MANHOLE STEPS:

A. Copolymer Polypropylene Plastic

1. Conform to ASTM A-478 and AASHTO M-198, the copolymer polypropylene plastic conforming to ASTM D-4101, and 54 inch Grade 60 deformed reinforcing bar meets ASTM-615.

2. Minimum cross sectional dimension of 1 inch in any direction, minimum pullout resistance of 1,500 lbs.

3. 16 inches (center to center) wide.

4. Manufacturers: American Step Company, M.A. Industries, Inc., or equal.

B. Provide steps and installation into pre-cast concrete sanitary sewer manhole sections only conforming to OSHA standards. Deform embedded portion of steps and grout to withstand specified live loading.

2.6 ADJUSTING RINGS

A. Provide adjusting rings manufactured from ARPRO Expanded Polypropylene (EPP), black 5000 series meeting ASTM D3575 and ASTM D4819-13 having a 27" ID. The rings shall be manufactured using a high compression molding process to produce a finished density of 120 g/L (7.5 pcf).

1. Manufacturers: Pro-Ring by Cretex Specialty Products

B. Mating Faces:

1. Provide rings that either have a keyway (groove) on the underside for vertical alignment and/or an adhesive trench with a flat upper surface.
2. Adhesive / Sealant:

   a. Provide adhesive or sealant for watertight installation of the adjusting rings using M-1 Structural Adhesive/Sealant or equal meeting the following specifications:
      (1) ASTM C-920, Type S, Grade NS, Class 25, Uses NT, T, M, G, A and O.
      (2) Federal Specification TT-S-00230-C Type II, Class A.
      (3) Corps of Engineers CRD-C-541, Type II, Class A.
   b. Manufacturers: ChemLink M-1 Structural Adhesive/Sealant, or equal.

3. Thickness:

   a. Provide rings in thicknesses which will allow final adjustment of the frame and cover or grate to within ¼" (one quarter inch) to ½" (one half inch) of the specified final elevation.
   b. 8 inch maximum.

2.7 EXTERNAL CHIMNEY SEAL FOR SANITARY MANHOLES

A. A chimney seal is required for all frames, adjusting rings and integrally cast lip of manhole.

B. Manufacturer:

1. WrapidSeal, Canusa (CCI Pipeline Systems)

2. Cretex Classic External Manhole Chimney Seal

3. FlexRib Manhole Frame-Chimney Seal, Trelleborg Pipe Seals

4. Infi-Shield, S.S.I Sealing Systems

5. External Adaptor Seal, Adaptor Inc.

6. Substitutions: Specified in Section 01 60 00 - Product Requirements

2.8 COATINGS

A. Provide cast-in-place concrete structures, pre-cast vaults and junction boxes with an exterior coating with a minimum of 2 coats, 8 mil. each, asphaltic / bitumastic coating.

2.9 CONSTRUCTION

A. Manhole Base Section: Unless otherwise shown, provide manhole base sections consisting of a base riser section with an integral floor. When benches are made at the manufacturing site, provide concrete used for benched inverts conforming to the requirements for concrete used for precast sections. When benches are made in the field, Class D concrete may be used.

B. Preformed Joints: Join riser, cone and flat slab top sections with joints filled with preformed joint sealing compound in accordance with the sealing compound manufacturer's recommendations, except that install sufficient sealing compound so as to completely fill the joint and show a "squeeze-out" on the inside and outside of the joint. Clean off all excess joint sealing compound from the inside surfaces.

C. Provide manhole top sections with precast reinforced eccentric cones unless precast reinforced flat slabs are specifically required or shown on the Drawings or are necessary because of shallow depth. Provide flat slabs with an opening offset unless otherwise required or shown. Design flat slabs for HS20 loadings.

2.10 SOURCE QUALITY CONTROL

A. Acceptance: Base acceptance of flat slab tops passing a proof-of-design test in accordance with ASTM C 478.

PART 3 EXECUTION

3.1 MANHOLE TYPES

A. Cast-In-Place Concrete Structures and Junction Boxes: As shown on Contract Drawings.

1. Conform to Section 03 31 00 - Cast-In-Place Concrete.

B. Sectional Pre-cast Concrete Vaults and Manhole:

1. Install steps at maximum 16 inch maximum spacing in vertical alignment in riser and eccentric cone of manholes.

2. Vaults and manholes 8 feet and deeper: Pre-cast concrete cone tops.

3. Vaults and manholes less than 8 feet deep: Pre-cast flat tops.

4. Use eccentric cone section or eccentric manhole flat top for manholes.

5. Use concentric cone section or concentric manhole flat top for vaults.

6. Install frames and covers as follows:

a. Sanitary manholes: Water resistant frame and covers, except where waterproof frames and covers are indicated on drawings.

b. Vaults and storm manholes: Solid (vented) covers except where slotted or beehive covers are indicated on Drawings.

3.2 EXCAVATION AND PREPARATION OF SUBGRADE

A. Excavate and prepare sub-grade in accordance with requirements of Section 31 23 16.

B. Make excavation diameter at least 6 in. greater than diameter of structure to permit joints to be sealed and to permit compaction of backfill material.

3.3 EXECUTION

A. When lifting manhole bases, base sections and/or riser sections, make sure the chain or cable lengths are long enough to prevent contact with the tongue and groove area, and are kept at appropriate lifting angles.

3.4 BASES

A. Cast-in-Place Base for Pre-cast Vaults, Manholes, and Inlets:

1. Place mudcoat onto bottom of the trench.

2. Use Class D concrete in conformance with Section 03 31 00.

3. Place reinforcing steel onto the mudcoat. See Section 03 20 00.

B. Pre-cast Vaults, Manholes, and Inlets with Integral Base:

1. Excavate deep enough so that bottom of manhole barrel section (with integral base) rests on 6 inches minimum of Select Fill Material. See Section 31 23 23.

3.5 BACKFILL

A. Backfill as specified in Section 31 23 23.

3.6 MANHOLE INVERT

A. Do not pour until manhole is in place and backfilled.

B. Provide invert of same cross section as larger of connecting piping.

C. Shape flow channel for branch piping as shown.

D. Use Class D concrete in accordance with Section 03 31 00.

3.7 PIPE CONNECTION

A. Pipe to Sanitary Manhole Connection:

1. Connect sanitary piping to pre-cast concrete manhole sections using flexible pipe-to-manhole connectors.

a. Lay pipe entering manhole through this connector.

b. Grouting or placing mortar in and around flexible connectors may inhibit the design and flexibility of the connector and should be avoided. To maintain seal flexibility, plug that portion of annular space between pipe and manhole wall which falls within area of poured invert with extrudable, preformed, plastic gasket prior to pouring manhole invert.

B. Pipe to Stormwater Manhole Connection:

1. Extend stormsewer piping into the opening through the wall of the precast concrete manhole sections.

2. Fill the annular space between the OD of the pipe and the opening in the manhole section with concrete brick and non-shrink mortar to prevent leakage. Cover brick with a layer of non-shrink mortar.

3. Upon completion of above, place Class D Concrete, per Section 03 31 00, to cast the bench in the base section of the stormwater manhole or the fillet at the bottom of the Inlet.

C. Pipe to Potable Water Vault Connection:

1. Extend Potable Water piping into the vault and make connections, if required, as shown in the Contract Drawings.

2. Fill the annular space between the OD of the pipe and the opening in the manhole section with concrete brick and non-shrink mortar to prevent leakage. Cover brick with a layer of non-shrink mortar.

3.8 MANHOLE STEPS

A. Align steps to form continuous ladder with steps equally spaced (On Centers) vertically at design distance of maximum 16 inches

B. Project steps minimum clear distance of 7 inches from wall of riser or eccentric cone section measured from point of embedment.

C. Place steps within an allowable tolerance of +/- l inches.

D. Design live load of 300 lbs. vertically and 200 lbs. pullout.

E. Installation Details:

1. Step is embedded a minimum of 3 inches into wall of manhole.

2. Cleats rise a minimum of % inches above surface of step. Also, a minimum of % inches depth, 3/8 inches width.

3.9 SETTING FRAMES AND CASTINGS

A. Set at elevation shown on Drawings.

B. Adjust frame to grade with adjusting rings per Specification Section 33 05 13, 2.6.A. Use no more than two rings total.

C. Install manhole frames with butyl rope.

D. Provide sanitary manhole with an external chimney seal installed over frames and castings.

E. Bolt waterproof frames to top of manhole and cast in place structures using minimum of six l-inch diameter bolts. Provide bolts passing through adjusting rings into manhole or structure.

3.10 FIELD QUALITY CONTROL

A. Pre-cast reinforced concrete base sections, risers, transitions, cones and tops are subject to rejection on account of failure to conform to any of the specification requirements.

B. Thoroughly wet all lift holes and all joints between pre-cast element and then be completely fill with mortar, smooth and point both inside and outside, to ensure water-tightness.

C. Place and align pre-cast sections to provide vertical sides and vertical alignment of the manhole steps. The completed manhole is to be rigid, true to dimensions, and be watertight.

D. Where the bitumastic coating has been damaged, it should be repaired using the same materials used at the precaster.

3.11 CLEAN MANHOLE

A. Clean newly constructed manholes of any accumulation of silt, debris, or foreign matter of any kind, and be free from such accumulations at the time of final inspection.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 33 05 50

LAYING AND JOINTING BURIED PIPELINES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Installation of all underground pipelines. Provide pipeline materials, coatings and linings as specified and pipe of the types, sizes and classes shown or specified.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 01 45 50 - Leakage Tests
2. Section 31 23 16 - Excavation - Earth and Rock
3. Section 31 23 23 - Backfilling
4. Section 33 05 55 - Buried Ductile Iron Pipe and Fittings
5. Section 33 05 70 - Locating Buried Pipelines
6. Section 33 13 00 - Disinfection
7. Section 33 30 00 - Sanitary and Storm Sewerage Piping

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1.	ASTM A 307	-	Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile
2.	ASME B16.1	-	Cast Iron Pipe Flanges and Flanged Fittings, C25, 125, 250, 800
3.	ASME B16.21	-	Nonmetallic Flat Gaskets for Pipe Flanges
4.	ASTM C 12	-	Practice for Installing Vitrified Clay Pipe Lines
5.	ASTM D 2321	-	Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
6.	ASTM D 2774	-	Practice for Underground Installation of Thermoplastic Pressure Piping
7.	ASTM C 361	-	Specification for Reinforced Concrete Low-Head Pressure Pipe

8. ASTM E 165 - Practice for Liquid Penetrant Examination

9. ASTM E 709 - Practice for Magnetic Particle Examination

10. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

11. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe With Threaded Flanges

12. AWWA C206 - Field Welding of Steel Water Pipe

13. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances

14. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4-in. Through 63-in, for Water Distribution

1.3 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:

B. Transportation and Delivery: Take every precaution to prevent damage or wear to the pipe during transportation and delivery to the site.

1. Cover pipe bell and spigot ends to keep the inside of the pipe clean of exhaust fumes, films, and other residue during transportation and delivery in accordance with the manufacturer's recommendations.

C. Loading and Unloading: Take extreme care in loading and unloading the pipe and fittings.

1. Work slowly with skids or suitable power equipment, and keep pipe under perfect control at all times.

2. Under no condition is the pipe to be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the pipe or coating.

3. Protect the pipe from drying effects and possible contamination.

D. Sling: Handle the pipe and fittings using of belt slings, padded cradles, or other devices, designed and constructed to prevent damage to the pipe, coating or lining. When handling the pipe with a crane or other lifting equipment, use a suitable sling around the pipe.

1. Under no condition pass the sling through the pipe.

2. Use a nylon canvas type sling or other material designed to prevent damage to the pipe and coating.

3. The use of steel cables, chains, hooks, or other like equipment that might injure the pipe, coating or lining will not be permitted.

E. Damaged Piping: If in the process of transportation, handling, or laying, any pipe or fitting is damaged, replace or repair such pipe or pipes.

F. Blocking and Stakes: Provide suitable blocking and stakes installed to prevent pipe from rolling.

1. Obtain approval for the type of blocking and stakes, and the method of installation.

G. Storage:

1. Storage for Pipe: Store stockpiled pipe on pallets, skids, sand or rock free berms, sand bags, old tires or other suitable means so that the pipe and coating is not damaged.

a. Do not roll, push, or slide the pipe into place.

b. Protect pipe that will be stored during periods of adverse environmental conditions from the effects of drying.

c. Arrange pipe that is placed in storage as not to cause inconvenience to traffic.

2. Storage for Gaskets: Store gaskets for pipe joints in a cool place and protect gaskets from light, sunlight, heat, oil, or grease until installed.

a. Do not use any gaskets showing signs of checking, weathering or other deterioration.

b. Do not use gasket material stored in excess of six months without approval.

1.4 FIELD CONDITIONS

A. Encase utilities that cross over new pipe in flowable fill as shown in the standard details. Reconstruct utilities damaged by pipeline construction.

1. Furnish and install all materials and do all work necessary for the reconstruction or repairs of sanitary sewers and services.

2. Provide pipe for reconstruction of sanitary sewers and services meeting the appropriate specification requirements.

3. Provide pipe of the same size as the existing sewer or when the same size is not available, use the next larger size of pipe. Obtain approval of joints made between new pipe and existing pipe.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.1 PREPARATION

A. Dry Trench Bottoms: Lay pipe only in dry trenches having a stable bottom.

1. Where groundwater is encountered, make every effort to obtain a dry trench bottom.

2. If a dry trench bottom has not been obtained due to improper or insufficient use of all known methods of trench dewatering, then the order to excavate below grade and place sufficient bedding material, crushed stone, or Class D concrete over the trench bottom may be given.

3. If all efforts fail to obtain a stable dry trench bottom and it is determined that the trench bottom is unsuitable for pipe foundation, obtain an order, in writing, for the kind of stabilization to be constructed.

4. Prevent water from entering the trench to the extent required to properly grade and allow for proper compaction of pipe bedding and backfill. Provide dewatering of surface water that enters the excavation for proper completion of the Work.

5. Perform trench excavation and backfill in accordance with Sections 31 23 16 and 31 23 23.

3.2 INSTALLATION

A. General: Install all piping in accordance with the manufacturer's recommendations, approved shop drawings and as specified. Refer to the specification specific to the pipe material being installed.

1. Arrange miscellaneous pipelines, which are shown in diagram form on the Drawings, clear of other pipelines and equipment.

2. Provide factory prepared pipe ends unless a field cut is required for connections.

3. Cutting Pipe and Dressing Cut Ends:

   a. Cut pipe with a portable guillotine saw, abrasive wheel, saw, or milling cutter. The use of flame cutting or hydraulic squeeze type cutters will not be acceptable. Field-cut holes for saddles with mechanical cutters; oxyacetylene cutting will not be acceptable.

   b. Cut pipe smooth, straight, and at right angles to the pipe axis in a neat manner, without damage to the pipe lining.

   c. After cutting, dress the ends of the pipe with a file or a power grinder to remove all roughness and sharp edges. Dress the ends of pipe in accordance with the type of joint to be made and as recommended by the manufacturer. Suitably bevel cut ends of push-on joint pipe as recommended by the manufacturer.

B. Code Requirements: Provide pipeline installations complying with AWWA C600 for ductile iron pipe, AWWA Manual M11 for steel pipe, ASTM D2774 for thermoplastic pressure piping 6-inch and smaller, ASTM D2321 for underground thermoplastic piping for gravity sewers, and as modified or supplemented by the Specifications.

C. Pipe Laying - General:

1. Thoroughly clean the interior of pipe and fittings of foreign matter prior to installation. Cut away any lumps or projections on the face of the spigot end or the shoulder.

2. For pipelines intended for gravity flow, begin pipeline laying at the low end of a run and proceed upgrade.

3. Generally, lay pipe with bells pointing ahead.

4. Do not lay pipe until the trench has been excavated as specified, shown, or as directed to provide a firm bed for supporting the pipe. Do not lay pipe upon a material in which frost exists nor at any time when the ENGINEER deems that there is a possibility of the formation of ice or the penetration of frost at the bottom of the excavation.

5. Carefully lay pipelines accurately to line and grade. Do not drop or dump pipe or accessories into trench. Lay pipelines in trench excavations on pipe bedding material or other foundations as shown, specified or ordered in writing. Rest no part of the pipe upon or against rock.

6. Lay pipelines not supported on piles, concrete cradle, or other structural support in pipe bedding material. Carefully grade and compact pipe bedding. Install the barrel of the pipe so that it is in contact on the sides and the bottom of the pipe with the shaped, compacted pipe bedding so as to provide full bearing on and uniform support by the pipe bedding throughout the entire length of pipe. Make adjustments by scraping away or filling in pipe bedding material under the body of the pipe. Hand tamping under the end of the pipe to bring it to grade or wedging or blocking up the pipe barrel is not permitted.

7. Properly secure the pipe against movement and make the pipe joints in the excavation as required. Bring the faces of the spigot ends and the bells of pipes into contact and firmly and completely shove the pipe home. Do not bring succeeding pipe into position until the preceding length is covered with backfill and secured in place.

8. Bell Holes:

   a. Cut out bell holes for each joint as required to permit the joint to be properly made and allow the barrel of the pipe to have full bearing throughout its length.

   b. Thoroughly tamp bell holes full of pipe bedding material following the making of each joint.

9. Take care to secure water tightness and to prevent damage to or disturbing of the joints during backfilling and after the pipes have been laid and the joints have been made.

10. Take every precaution to prevent the floating of the pipe due to water accumulation in the trench, or the collapse of the pipeline from any cause. Should floating or collapse occur, inspect for damage. Replace any damaged pipe at no expense to the OWNER.

11. Keep the interior of pipelines clean and free of dirt and other deleterious material during construction. Maintain a clean pipe interior clear of sand, dirt, mortar splatter, and any other deleterious material prior to testing the completed pipeline.

D. Other Foundations: Install pipelines laid on other types of foundations as specified for such other foundations or as ordered in writing.

E. Ductile Iron Pipe Mechanical Joints:

1. Assembly:

   a. In making up mechanical joints, center the spigot in the bell.

b. Thoroughly brush the surfaces with which the rubber gasket comes in contact with a wire brush just prior to assembly of the joint.

c. Brush lubricant over the gasket just prior to installation.

d. Place the gasket and gland in position, bolts inserted, and the nuts tightened fingertight.

e. Tighten the nuts with a torque wrench so that the gland is brought up toward the pipe evenly.

f. Prime bolts by dipping with a bituminous coating, except the threads. Coat threads immediately prior to installation of nuts.

2. Torques: Apply bolt torques complying with AWWA C600 (latest edition).

3. Remaking of Joints: If effective sealing is not obtained at the maximum torque listed above, disassemble and reassemble the joint after thorough cleaning.

4. Restrained Mechanical Joint: Where specified or shown on the Drawings, restrain mechanical joint with EBAA Meagalug, Romac Industries, or approved equal.

F. Temporary Bulkheads: Provide temporary bulkheads at the ends of sections where adjoining pipelines have not been completed, and in connections built into pipelines where adjoining pipelines or structures have not been completed and are not ready to be connected.

1. Remove bulkheads encountered in connecting sewers or structures included in this Contract, or in pipelines or structures previously built, when they are no longer needed or when ordered.

G. Sleeve Type Couplings: For sleeve type couplings, equally tighten diametrically opposite bolts on the connection so that the gaskets will be brought up evenly all around the pipe.

1. Torque Wrenches: Do the final tightening with torque wrenches set for the torque recommended by the coupling manufacturer.

H. Concrete Cradle

1. General: When a concrete cradle is shown, specified, or ordered in writing, lay the pipe to grade by supporting each section on concrete blocks located near each end.

a. Shape the tops of the blocks to fit the outside diameter of the pipe.

b. Set the blocks approximately 3/8 inch low.

c. Place the pipe on the blocks on a layer of stiff mortar of sufficient thickness to bring the pipes to exact grade.

d. Timber blocking is not acceptable.

2. Cradle: Place Class D concrete cradle, on one side only, until it has risen above the invert on the other side, after which deposit the remainder of the concrete on both sides to the pipe spring line.

a. Prevent movement of the pipe during concrete placement.

I. Concrete Encasement: When concrete encasement is to be provided, as shown, specified, or ordered in writing, lay and block the pipeline and place concrete as specified for concrete cradle.

1. Continue the placing of concrete to provide complete encasement to the dimensions shown, specified, or ordered.

J. Valve Box Setting: Install valve boxes vertical and concentric with the valve stem.

1. Satisfactorily reset any valve box which is moved from its original position, preventing the operation of the extension valve stem.

2. Replace any extension valve stem which has been damaged so that it can be operated.

K. Erection:

1. Anchorage: Place anchorage of pipelines and appurtenances as shown on the Drawings or as ordered.

a. Accomplish anchorage by placing concrete to the dimensions shown between undisturbed earth and the fitting to be anchored.

b. Provide restrained joints as specified in Section 33 05 55 as the primary method for thrust restraint. Install pipe with restrained joints for the distance (both upstream and downstream of pipeline appurtenances) as shown.

c. Thrust blocks are not allowed for use on this project.

2. Valve Setting: Erect valves carefully in their proper positions, free from all distortion and strain, with flanged, mechanical or push-on joints, and pack and leave in satisfactory operating condition.

3. Short Tunnel Construction: Joint pipes to be placed in short tunnels prior to being placed into position.

a. Place the pipe into position in a manner which keeps joints tight.

3.3 FIELD QUALITY CONTROL

A. Testing: Test pipelines in accordance with Section 01 45 50.

1. Test valves in place, as far as practicable, and correct any defects in valves or connections.

B. Inspection: Clean, inspect, and examine each piece of pipe and each fitting and special defects before it is installed.

1. Cut away any lumps or projections on the face of the spigot end or the shoulder.

2. Do not use any cracked, broken, or defective pieces of the work.

3. If any defective piece should be discovered after having been installed, remove and replace this piece with a sound piece in a satisfactory manner at no increase in Contract Amount.

3.4 CLEANING

A. General: Thoroughly clean all pipe before it is laid and keep it clean until it is accepted in the completed work.

B. Removal of Materials: Exercise special care to avoid leaving bits of wood, dirt, and other foreign particles in the pipe. If any particles are discovered before the final acceptance of the work, remove and clean the pipe.

3.5 SCHEDULE

A. Definitions: Abbreviations used in the schedule are:

1. Pipe Materials:

a.	DI	Ductile Iron
b.	RCP	Reinforced Concrete Pipe

2. Joints:

a.	B&S	Bell and Spigot
b.	MJ	Mechanical Joint

3. Coatings and Linings:

a. BC Bituminous - Cold Application
b. CL Cement-Mortar Lined
c. PEW Polyethylene Wrapped

B. Schedule: Provide products as listed in the following schedule:

END OF SECTION

BURIED PIPING SCHEDULE

Facility/Service	Size (Inches)	Pipe Material	Protective Coatings Int.	Protective Coatings Ext.	Joints[4]	Test Pressure (psig)	Pipe Class or Thickness (inches)	Notes and Remarks
Stormwater Management System								
Storm Sewer	8	RCP	--	--	B&S	--	35	1
	12	RCP	--	--	B&S	--	35	1
Canopy Drainage	4	DI	CL	BC, PEW	MJ	5	PC 150	2

Notes:

1. Refer to Section 33 05 52.
2. Refer to Section 33 05 55

END OF SECTION

SECTION 33 05 52

REINFORCED CONCRETE SEWER PIPE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Furnishing and installing reinforced concrete sewer pipe, fittings and specials.

B. Related Work Specified in Other Sections Includes, but is Not Limited to, the Following:

1. Section 01 45 50 - Leakage Tests
2. Section 33 05 50 - Laying and Jointing Buried Pipelines

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ASTM C 76 - Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

2. ASTM C 443 - Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric).

3. ASTM C 497 - Specification for Testing Concrete Pipe and Tile.

1.3 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

B. Shop Drawings: Submit complete shop drawings for all diameters and classes of reinforced concrete pipe, fittings and specials showing dimensions, strength and materials specifications and standards, joint details, reinforcement position and plastic sheet lining details for approval prior to manufacture.

C. Materials Compliance: Submit notarized affidavits of all materials compliance with ASTM C 76.

D. Product Compliance: Submit notarized affidavit of pipe compliance with ASTM C 76 and these specifications.

E. Quality Control: Submit certified results of all shop tests for approval.

1.4 QUALITY ASSURANCE

A. General: Provide concrete sewer pipe, fittings and specials that are precast or machine made and are the product of a concern that can demonstrate by tests and installation records satisfactory experience in manufacturing concrete pipe of the quality and type specified.

B. Reinforced Concrete Pipe: Provide reinforced concrete pipe meeting the requirements of ASTM C 76 and these specifications.

C. Joints: Provide joints for pipe, fittings and specials meeting the requirements of ASTM C 443 and these specifications.

PART 2 PRODUCT

2.1 REINFORCED CONCRETE PIPE

A. General: Manufacture all reinforced concrete pipe in lengths of not more than 16 feet and not less than 7-1/2 feet, except where shorter lengths are required for pipeline curves or at junctions with structures. Do not use admixtures or blends in concrete without prior approval.

B. Design: Provide the classes of reinforced concrete sewer pipe as shown or specified. Conform pipe designs with the following requirements.

1. Use diameter, wall thickness, compressive strength of concrete and area of circumferential reinforcement as prescribed for Classes I to IV in Tables 1 to 5 in ASTM C 76, except do not use Wall A thickness, elliptical reinforcing cages or quadrant reinforcing mats. Do not substitute modified designs for designs shown in the Tables.

2. Provide special designs only for pipe with diameters and loads beyond those shown in Tables 1 to 5, pipe diameters that do not have steel reinforcement areas shown in the Tables and pipe subject to thrust forces encountered in jacking operations. Conform special designs with the requirements of Section 7.2.2 of ASTM C 76, except do not use Wall A thickness, elliptical reinforcing cages or quadrant reinforcing mats without prior approval. Retain a Registered Professional Engineer, licensed to practice structural

engineering in the state in which the pipe will be installed, to prepare, sign and seal all special designs for pipe.

2.2 REINFORCED CONCRETE FITTINGS AND SPECIALS

A. General: Provide reinforced concrete fittings and specials where shown, specified or required, and manufactured in accordance with the applicable sections of the respective standard for the adjoining pipe. Provide joints the same as in the adjoining pipe. Provide the interior surface of bends of the same smoothness and diameter as the adjoining pipe. Provide the center line radius of curvature of bends to be equal, in dimension, to the inside diameter of the pipe.

B. Strength: Design all reinforced concrete fittings and specials to have the same strength as the class of the adjoining pipe. Retain a Registered Professional Engineer, licensed to practice structural engineering in the state in which the pipe will be installed to prepare, sign and seal all designs for fittings and specials.

2.3 JOINTS

A. Manufacture all reinforced concrete sewer pipe, fittings and specials with watertight joints using rubber gaskets in accordance with the requirements of ASTM C 443. Provide a preformed groove in the tongue or spigot of sufficient depth to hold the gasket securely in place and produce the proper gasket compression.

2.4 CURING

A. Cure all pipe, fittings and specials by steam or membrane curing. Water curing is not permitted.

2.5 SHOP TESTING

A. General: Test concrete sewer pipe in accordance with the applicable provisions of ASTM C 497, as required by the ASTM Specification for the pipe and as specified herein.

B. Basis of Acceptance: Conform the basis of acceptance for reinforced concrete pipe with Section 5.1.1 of ASTM C 76 and these specifications.

C. Proof-of-Adequacy Tests for Special Designs: Prior to manufacturing production run pipe of special design, test one pipe of at least four feet in length of each diameter and class by the three-edge-bearing method to confirm that the pipe meets both the 0.01-inch crack and ultimate load requirements for which it is designed.

D. Joint Adequacy Tests: Prior to manufacturing production run pipe, fittings and specials, conduct all tests required by Sections 9 and 10 of ASTM C 443 for each diameter of pipe.

E. Finished Pipe Tests: Test one to three pipe sections of each diameter and class out of the first 100 pipe sections manufactured, or fraction thereof, by the three-edge-bearing method in accordance with Section 11.3 of ASTM C 76. The ENGINEER will select and determine the number of pipe sections to be tested. Test one pipe section, selected by the ENGINEER, of each diameter and class from each subsequent lot of 100 pipe sections manufactured, or fraction thereof.

F. Test Witnessing: Arrange for a qualified representative of an independent testing laboratory to witness all tests and provide certified test results.

G. Costs of Tests: Pay all costs associated with tests and test witnessing.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all reinforced concrete sewer pipe, fittings and specials in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.

3.2 LEAKAGE TESTS

A. Test the reinforced concrete sewers for leakage after completion in accordance with Section 01 45 50.

3.3 SCHEDULES

A. Refer to the schedule contained in Section 33 05 50 for information on the piping that is to be constructed using the pipe materials and methods specified herein.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 33 05 55

BURIED DUCTILE-IRON PIPE AND FITTINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for providing buried ductile-iron pipe, fittings and appurtenances, except soil pipe.

1. Provide ductile-iron pipe and fittings complete with all necessary jointing facilities and materials, specials, adapters and other appurtenances required for installation in and completion of the pipelines to be constructed.

2. Provide flanged, plain end or rubber gaskets (push-on or mechanical joint) of the types, sizes and classes shown or specified.

B. Related Work Specified In Other Sections Includes, But is Not Limited to, the Following:

1. Section 01 45 50 - Leakage Test
2. Section 09 96 00 - High Performance Coatings
3. Section 33 05 50 - Laying and Jointing Buried Pipelines
4. Section 33 13 00 - Disinfection
5. Section 33 05 70 – Locating Buried Pipelines

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. AWWA C104/ A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

2. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids

3. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings 3 In. Through 48 In., for Water and Other Liquids

4. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

5. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe With Threaded Flanges

6. AWWA C150/A21.50 - Thickness Design of Ductile-Iron Pipe

7. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water and Other Liquids

8. AWWA C600 - Installation of Ductile- Iron Mains and Their Appurtenances

9. AWWA C153/A21.53 - Ductile-Iron Compact Fittings, 3 In. Through 12 In., for Water and Other Liquids

10. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings

11. AWWAC606 - Grooved and Shouldered Type Joints

12. ASTM A 307 - Carbon Steel Externally Threaded Standard Fasteners

1.3 SYSTEM DESCRIPTION

A. Design Standards: Provide ductile-iron pipe meeting the requirements of AWWA C151/A21.51.

1. Provide pipe of the various sizes and classes as specified in the schedule or shown, except provide minimum Thickness Class 53 for pipe with threaded flanges. Locate restrained joints and various beddings as shown

2. Provide pipe laying lengths in 18 or 20 feet nominal lengths with allowable trim pipe lengths in accordance with AWWA C151 and special shorter lengths as required by the Drawings.

3. Manufacture, fabricate, coat, and line each length of pipe at a single plant location by a qualified pipe supplied. Fabricate fittings and specials by the same qualified supplied as the pipe. Fittings and specials may be fabricated at a site other than where the pipe is manufactured. Conduct testing and application of linings and coatings where the pipe, fitting, or special is manufactured.

4. Construct concrete encasements where shown.

1.4 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

B. Submit the following shop drawings:

1. Pipe joints, fittings, sleeves and cleanouts. Where special designs or fittings are required, show the Work in large detail and completely describe and dimension all items.

2. Fully dimensioned drawings of piping layouts, including fittings, couplings, sleeves, cleanouts, valves, supports and anchors. Label pipe size, materials, type, and class on drawings and include the limits of each reach of restrained joints. Provide cross sections showing elevations of cleanouts, pipes, fittings, sleeves, and valves.

3. Alignment survey and laying schedule as specified in Division 1. Cross reference the laying schedule to identification marks on pipeline pieces.

4. Catalog data for pipe, joints, fittings, sleeves, harnessing and cleanouts.

C. Quality Control: Submit certificate of compliance for pipe, fittings, gaskets, lining, polyethylene encasement, coatings, specials, sleeves, cleanouts, appurtenances, and other products that the items are in compliance with the Contract Documents, referenced standards, and “American Iron and Steel (AIS)” requirements.

1.5 INSPECTION

A. Work under this Specification including the production and testing of the pipe, specials or fittings is subject to inspection by the OWNER and/or the ENGINEER in the pipe supplier’s and/or pipe manufacturer’s plant.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle all pipe, fittings and appurtenances as specified in Division 1 and Section 33 05 50.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers are listed below. Manufacturers of equivalent products may be submitted.

1. Ductile-iron pipe and fittings.

a. American Cast Iron Pipe Company
b. McWane Incorporated
c. United States Pipe and Foundry

2. Joints:

a. Restrained Mechanical Joint

(1) EBAA Iron, Inc. MEGAL UG Series 1100\
(2) Romac Industries
(3) Tyler Union

3. Gaskets.

a. John Crane, Inc.
b. Garlock Packing Company
c. U.S. Rubber Company
d. American Cast Iron Pipe Company
e. United States Pipe and Foundry
f. McWane Inc.

4. Coatings and Linings.

a. Kop-Coat
b. Tnemec
c. American Cast Iron Pipe Company
d. United States Pipe and Foundry

2.2 MATERIALS

A. Fittings: Provide all fittings meeting the requirements of AWWA C110/A21.10, unless shown or specified otherwise. Fittings 14 inches and larger require a pressure rating of 150 psi, or as specified, whichever is greater.

1. Flanged: Where long radius flanged fittings and other flanged fittings not covered in AWWA C110/A21.10 are shown or specified, provide items meeting the requirements of AWWA C110/A21.10 and having laying lengths conforming to ASME B16.1 for 125-pound American Standard fittings.

2. Compact Mechanical Joint and Rubber Gasket Joint: Where compact mechanical joint or rubber gasket joint fittings are shown or specified, provide items meeting the requirements of AWWA C153/A21.53.

B. Gasket Joints

1. Provide mechanical joints meeting the requirements of AWWA C110/A21.10, AWWA C111/A21.22, and AWWA C153/A21.53 as applicable.

2. Where specified or shown on the Drawings, restrain mechanical joint with EBAA Megalug, Romac Industries, or approved equal.

3. Fasteners: Provide anti-rotational T-bolts and nuts on mechanical joints, except where special bolts are supplied with the approved restraint device, that are high strength, corrosion resistant, Type 304L stainless steel, annealed, minimum 60,000 psi tensile strength, in accordance with the manufacturers recommendations meetings the requirements of AWWA C111 and ASTM F593. Nuts are to be Xylan or FluoroKote #1 (corrosion resistant) coated.

C. Connecting Pieces and Special Fittings

1. General: Provide connecting pieces, such as bell and bell, and bell and spigot meeting the requirements of AWWA C110/A21.10

2. Design: Provide special fittings, where required, of an approved design that have the same diameters and thicknesses as standard fittings, unless otherwise required but their laying lengths and other functional dimensions are determined by their positions in the pipeline and by the particular piping materials to which they connect.

D. Temporary Bulkheads: Provide temporary bulkheads at the ends of sections where adjoining pipelines have not been completed and are not ready to connect.

1. Remove temporary bulkheads when they are no longer needed.

E. Linings and Coatings

1. Cement Lining: Provide ductile iron pipe and fittings having a cement-mortar lining not less than standard thickness meeting the requirements of AWWA C104/A21.4, unless shown or specified otherwise. Finish interior of the pipe so that the Hazen-Williams friction factor will not be less than 140.

    a. Repair: Repair cement mortar lining damaged during handling, hauling, storage or installation.

2. Asphaltic Coating: Shop coat pipe which is to be buried with the standard asphaltic outside coating meeting the requirements of AWWA C151/A21.51.

3. Encased Pipe: Do not coat or paint the outside of fittings and pipe which are to be encased in concrete.

4. Labels: Label the supplier's name or trademark, size, pressure class, manufacture date, bend angle turned and locations of short and long sides, and control number cross referenced to the laying schedule conspicuously in white on the outside of each pipe, fitting, and special casting after the shop coat has hardened. Provide cast marks and other marks in accordance with applicable standards.

5. Flange Joints: Immediately after facing and drilling, coat the back of the flanges and bolt holes with asphaltic coating meeting the requirements of AWWA C151/A21.51

F. Ball Joint: Provide ductile iron ball joint pipe meeting the requirements of AWWA C151 with a minimum joint deflection capacity of 15 degrees. Provide each ball joint with a rubber gasket designed to handle joint deflection.

G. Conformance with NSF Standards: Provide certification that all materials that may come in contact with the water being conveyed (linings, gaskets, lubricants, grout, disinfection agents, etc.) are in accordance with and approved by the appropriate NSF Standard 60 or 61.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all buried ductile iron pipe and fittings in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 01 and Section 33 05 50.

B. Load, transport, install, and test ductile iron pipe per AWWA C600.

C. Calibrate test equipment used in activities affecting quality control in accordance with the requirements of the test equipment manufacturer prior to use.

3.2 BALL JOINT DEFLECTION

A. Joint deflection of any single ball joint is not to exceed 50 percent of the manufacturer's allowable deflection.

3.3 CUTTING PIPE

A. Cut pipe with milling type cutter, rolling pipe cutter, or abrasive saw cutter. Do not flame cut.

3.4 LEAKAGE TESTING

A. Cleaning: Flush, clean, and test pipes after installation.

B. Testing: Test pipes for leaks and repair or tighten as required.

C. Procedures: Conduct tests in accordance with Section 01 45 50.

3.5 DISINFECTION

A. General: Disinfect all pipelines that are to carry potable water before they are placed into service as specified in Section 33 13 00.

3.6 SCHEDULES

A. Refer to the Schedules contained in Section 33 05 50 Laying and Jointing Buried Pipelines for information on the piping that is to be constructed using the pipe materials and methods specified herein.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 33 30 00

SANITARY AND STORM SEWERAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Furnishing and installing reinforced concrete sewer pipe, fittings and specials.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 01 45 50 - Leakage Tests
2. Section 33 05 50 - Laying and Jointing Buried Pipelines

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ASTM D 3034 - Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

2. Standard Specifications for Water and Sewer Construction in Illinois, latest edition

1.3 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

B. Shop Drawings: Submit complete shop drawings for all diameters and classes of reinforced concrete pipe, fittings and specials showing dimensions, strength and materials specifications and standards, joint details, reinforcement position and plastic sheet lining details for approval prior to manufacture.

C. Materials Compliance: Submit notarized affidavits of all materials compliance with ASTM C 76.

D. Product Compliance: Submit notarized affidavit of pipe compliance with ASTM C 76 and these specifications.

E. Joint Compliance: Submit notarized affidavit of joint compliance with ASTM C 443 and these specifications.

F. Quality Control: Submit certified results of all shop tests for approval.

1.4 QUALITY ASSURANCE

A. General: Provide concrete sewer pipe, fittings and specials that are precast or machine made and are the product of a concern that can demonstrate by tests and installation records satisfactory experience in manufacturing concrete pipe of the quality and type specified.

B. Joints: Provide joints for pipe, fittings and specials meeting the requirements of ASTM C 443 and these specifications.

PART 2 PRODUCT

2.1 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Confirm to ASTM D 2241 or ASTM D 3034.

B. Required Thickness: SDR 26 for depth of cover 0’ – 15’ and SDR 21 for depth of cover 0’ – 20’.

C. Provide PVC plastic pipe and fittings with a cell classification of 12454-B or C, as defined in ASTM D 1784.

D. Fittings: Molded in one piece with elastomeric joints

E. Joints: ASTM D3212 or ASTM D3139

F. Gaskets: ASTM F477 and ASTM F913

G. Provide PVC fittings of joint type and SDR as connecting PVC pipe.

H. Do not mix different manufacturer's products, or fittings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all PVC sewer pipe, fittings and specials in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.

3.2 LEAKAGE TESTS

A. Test the PVC sewers for leakage after completion in accordance with Section 01 45 50.

3.3 SCHEDULES

A. Refer to the schedule contained in Section 33 05 50 for information on the piping that is to be constructed using the pipe materials and methods specified herein.

END OF SECTION

(NO TEXT FOR THIS PAGE)

CITY OF EVANSTON

BID NUMBER 23-58

SERVICE CENTER NORTH FUEL ISLAND REPLACEMENT PROJECT

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

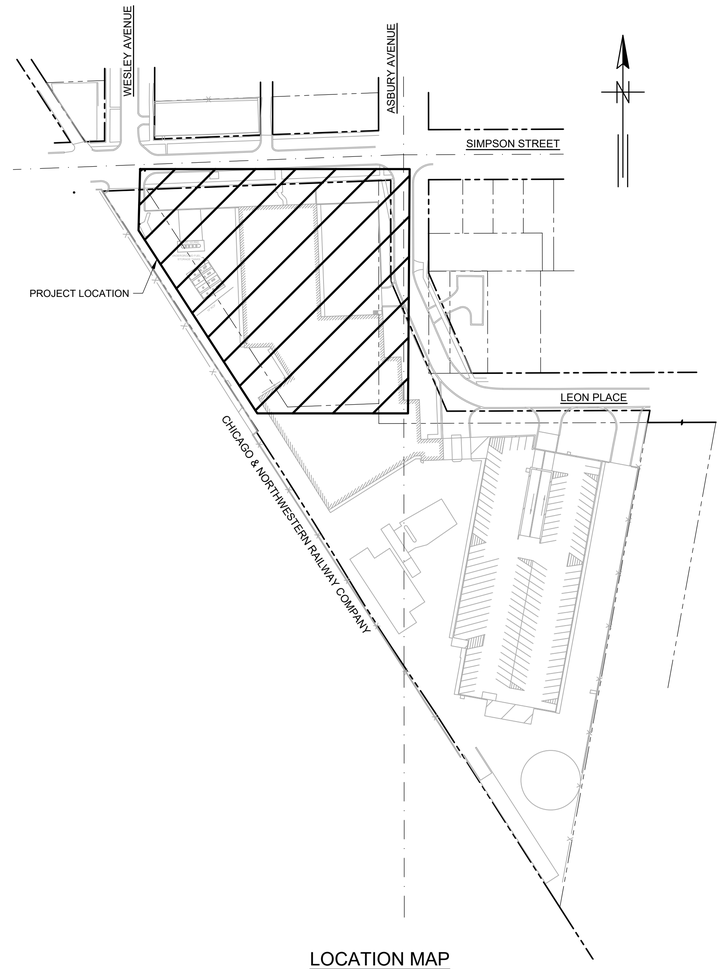
SEAL AFFIXED
12-08-2023
EXP. 11-30-2025

DECEMBER 2023

DRAWING INDEX

GENERAL ABBREVIATIONS

A	
@	AT
&	AND
*	VERIFY IN FIELD
AB	ANCHOR BOLT
ABAND	ABANDON(ED)
ABC	AGGREGATE BASE COURSE
AC	ASPHALTIC CONCRETE
ACP	ASBESTOS CEMENT PIPE
ADDL	ADDITIONAL
ADMIN	ADMINISTRATION
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
ALT	ALTERNATEorALTERNATIVE
ALUM	ALUMINUM
APPROX	APPROXIMATE / APPROXIMATELY
ARCH	ARCHITECTURAL
ARV	AIR RELEASE VALVE
ASPH	ASPHALT
ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS
AUX	AUXILIARY
AVE.	AVENUE
AVG	AVERAGE
B	
B/	BOTTOM OF
BF	BLIND FLANGE
BFV	BUTTERFLY VALVE
BL	BASELINE
BLDG	BUILDING
BP	BOOSTER PUMP
BPS	BOOSTER PUMP STATION
BRG	BEARING
BOT	BOTTOM
BC	BACK OF CURB
BM	BENCHMARK
BMPs	BEST MANAGEMENT PRACTICES
BSMT	BASEMENT
BTWN	BETWEEN
BVC	BEGIN VERTICAL CURVE
C	
CAP	CORRUGATED ALUMINUM PIPE
CB	CATCH BASIN
CEN	CENTER
CHEM	CHEMICAL
CI	CAST IRON
CIP	CAST IRON PIPE / CAST IN PLACE
CIR.	CIRCLE
CJ	CONTROL JOINT / CONSTRUCTION JOINT
CKV	CHECK VALVE
CL	CENTERLINE
CLR	CLEAR
CLSM	CONTROLLED LOW STRENGTH MATERIAL
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CO	CLEANOUT
COL	COLUMN
CONN	CONNECTION
CONC	CONCRETE
CONT	CONTINUOUS
CONT'D	CONTINUED
COORD	COORDINATE
CP	CONTROL POINT
CPVC	CHLORINATED POLYVINYL CHLORIDE
CS	COMBINED SEWER
CU	CUBIC
D	
D	DEPTH
DB	DUCT BANK
DBL	DOUBLE
DEG	DEGREE
DEMO	DEMOLISH / DEMOLITION
DIA or Ø	DIAMETER
DIAG	DIAGONAL
DI	DUCTILE IRON
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DISCH	DISCHARGE
DN	DOWN
DR.	DRIVE
DWG	DRAWING (S)
E	
E	EAST
EA	EACH
ECC	ECCENTRIC
EF	EACH FACE
EFL	EFFLUENT
EG	EXISTING GRADE
EHH	ELECTRIC HAND HOLE
EJ	EXPANSION JOINT
EL/ELEV	ELEVATION
ELEC	ELECTRIC / ELECTRICAL
EMH	ELECTRIC MANHOLE
EO	EDGE OF
EOP	EDGE OF PAVEMENT
EQ	EQUAL
EQUIP	EQUIPMENT
EW	EACH WAY
EX or EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR
F	
FD	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FDN	FOUNDATION
FEP	FLUORINATED ETHYLENE PROPYLENE
FF	FINISHED FLOOR
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL	FLOOR
FLG	FLANGE (D)
FM	FORCE MAIN
FND	FOUND
FPS	FEET PER SECOND
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FEET
FTG	FOOTING
FWY.	FREEWAY
G	
GA	GAUGE
GAL	GALLON
GB	GRADE BREAK
GM	GAS MAIN
GPM	GALLONS PER MINUTE
GR	GRADE
GV	GATE VALVE
H	
H	HEIGHT
HDD	HORIZONTAL DIRECTIONAL DRILLING
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
HP	HIGH POINT
HPI	HORIZONTAL POINT OF INTERSECTION
HW	HEADWALL
HWL	HIGH WATER LEVEL
HWY.	HIGHWAY
HYD	HYDRANT
I	
ID	INSIDE DIAMETER
I.F.	INSIDE FACE
IN.	INCHES
INF	INFLUENT
INLT	INLET
INT	INTERIOR
INV	INVERT
IP	INLET PROTECTION
IPS	IRON PIPE STRAIGHT (THREAD)
IR	IRRIGATION
J	
JB	JUNCTION BOX
JT	JOINT
K	
KGV	KNIFE GATE VALVE
L	
L	LENGTH
LB(S)	POUND(S)
LF	LINEAR FOOT / FEET
LN.	LANE
LOC	LIMIT OF CONSTRUCTION
LOD	LIMIT OF DISTURBANCE
LP	LOW PRESSURE / LOW POINT / LIGHT POST
LR	LONG RADIUS
LS	LIFT STATION
LT	LEFT
LWL	LOW WATER LEVEL
M	
MAX	MAXIMUM
MFR	MANUFACTURER
MG	MILLION GALLONS
MGD	MILLION GALLONS PER DAY
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
ML	MONUMENT LINE
N	
N	NORTH
NAD	NORTH AMERICAN DATUM
NAVD	NORTH AMERICAN VERTICAL DATUM
N/A	NOT APPLICABLE
NEC	NATIONAL ELECTRICAL CODE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NO. or #	NUMBER
NOM	NOMINAL
NPT	NATIONAL PIPE THREAD
NTP	NOTICE TO PROCEED
NTS	NOT TO SCALE
O	
OC	OVERHEAD COMMUNICATION
O.C.	ON CENTER
OD	OUTSIDE DIAMETER
OE	OVERHEAD ELECTRIC
OF	OVERHEAD FIBER
O.F.	OUTSIDE FACE
OH	OVERHEAD
OPNG	OPENING
OPP	OPPOSITE
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OT	OVERHEAD TELEPHONE
OTV	OVERHEAD TELEVISION
P	
PB	PULLBOX
PC	POINT OF CURVATURE
PE	PLAIN END
PKWY.	PARKWAY
PL	PLACE / PLATE / PROPERTY LINE
PMP	PUMP
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVE
Ph	POTENTIAL OF HYDROGEN
PH	POTHOLE
PRC	POINT OF REVERSE CURVATURE
PRV	PRESSURE REDUCING VALVE
PS	PUMPING STATION
PSF	PRESSURE PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSV	PRESSURE SUSTAINING VALVE
PT	POINT OF TANGENCY / PRESSURE TREATED
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
PVR	PRESSURE VACUUM RELIEF
Q	
QS	QUARTER SECTION
R	
R	RADIUS
RCA	RESTRAINED COUPLING ADAPTER
RCP	REINFORCED CONCRETE PIPE
RD.	ROAD
RED	REDUCER
RECIRC	RECIRCULATION
REF	REFERENCE
REINF	REINFORCED/REINFORCEMENT
REQ'D	REQUIRED
RES	RESERVOIR
RFCA	RESTRAINED FLANGED COUPLING ADAPTER
RJ	RESTRAINED JOINT
ROW	RIGHT OF WAY
RR	RAILROAD
RT	RIGHT
RTU	ROOF TOP UNIT
S	
S	SOUTH / SLOPE
SB	SOIL BORING
SCH	SCHEDULE
SDR	STANDARD DIMENSTION RATIO
SF	SQUARE FOOT / FEET
SHGC	SOLAR HEAT GAIN COEFFICIENT
SHT	SHEET
SIM	SIMILAR
SPEC	SPECIFICATION(S)
SS	SANITARY SEWER
SST	STAINLESS STEEL
ST	STORM SEWER
ST.	STREET
STL	STEEL
STA	STATION
STR	STRUCTURE
S/W	SIDEWALK
SWPP	STORM WATER POLLUTION PREVENTION PLAN
SY	SQUARE YARD
SYM	SYMMETRICAL
T	
T	TANGENT
T/	TOP OF
T&B	TOP AND BOTTOM
TBD	TO BE DETERMINED
TBM	TEMPORARY BENCHMARK
TC	TOP OF CURB
TEL	TELEPHONE
TEMP	TEMPORARY / TEMPERATURE
THK	THICK(NESS)
TOB	TOP OF BANK
TOC	TOP OF CONCRETE
T.O.P.	TOP OF PIPE
TP	TREE PROTECTION
TS	TRAFFIC SIGNAL
TV	TELEVISION
TYP	TYPICAL
U	
UC	UNDERGROUND COMMUNICATION
UE	UNDERGROUND ELECTRIC
UF	UNDERGROUND FIBER
UT	UNDERGROUND TELEPHONE
UTV	UNDERGROUND TELEVISION
UNK	UNKNOWN
UON	UNLESS OTHERWISE NOTED
UV	ULTRA VIOLET
V	
V	VOLUME / VELOCITY
VB	VALVE BOX
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
VPI	VERTICAL POINT OF INTERSECTION
W	
W	WEST / WIDE
W/	WITH
W/O	WITHOUT
WM	WATER MAIN
WP	WORKPOINT
WS	WATER STOP
WSE	WATER SURFACE ELEVATION
WT	WEIGHT / WATER TIGHT
WTP	WATER TREATMENT PLANT
WWF	WELDED WIRE FABRIC
WWTP	WASTE WATER TREATMENT PLANT
X	
X	COORDINATE VALUE (EAST-WEST DIRECTION)
XFR	TRANSFORMER
Y	
Y	COORDINATE VALUE (NORTH-SOUTH DIRECTION)
YD	YARD
YH	YARD HYDRANT
YR	YEAR
Z	



LOCATION MAP
SCALE: 1" = 100'

BID SET

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED	BW
DRAWN	GS
CHECKED	MD

MICHAEL A. DERNA 062.066817 LICENSED PROFESSIONAL ENGINEER OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE
100 0 100 200 FT
1"=100'

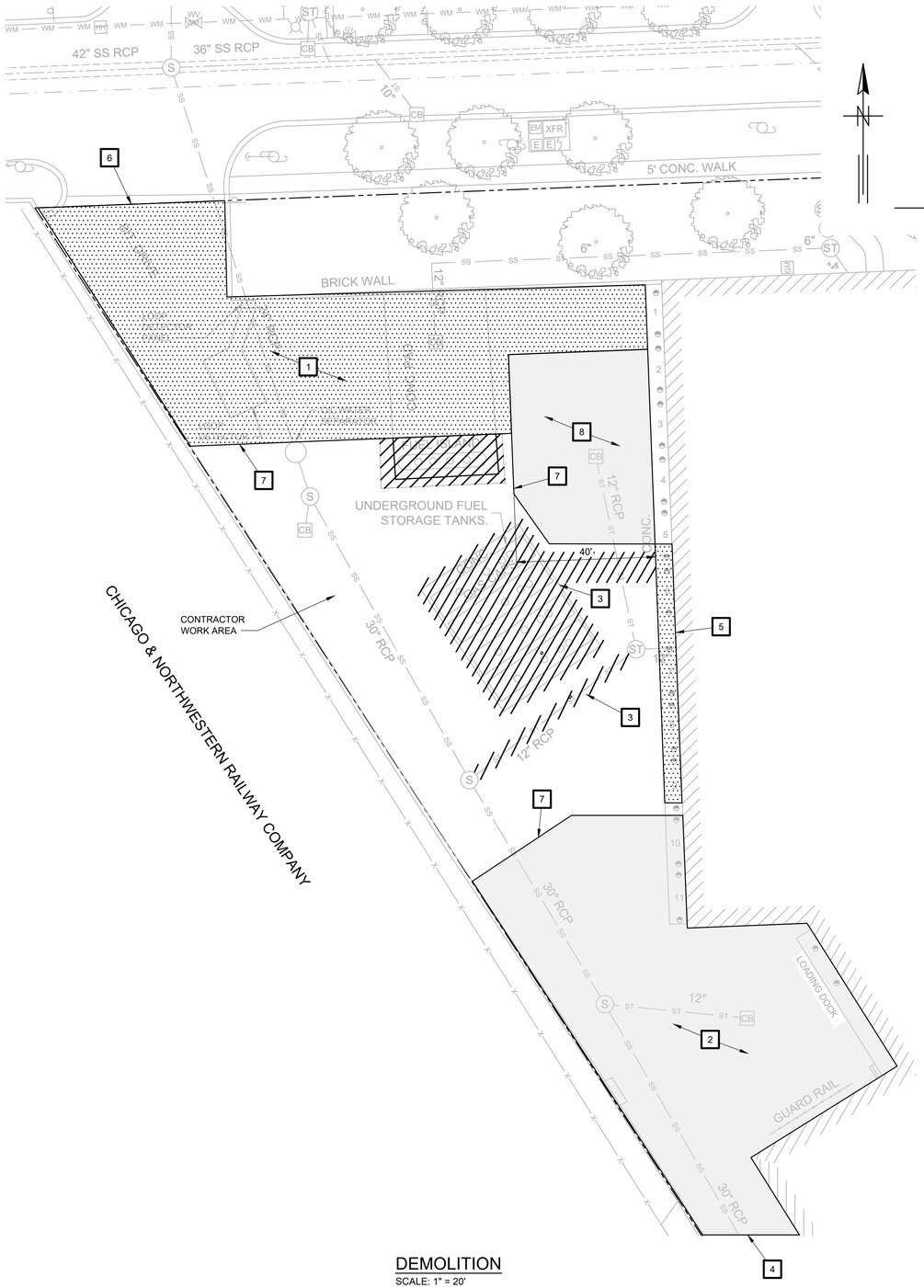
CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

GENERAL

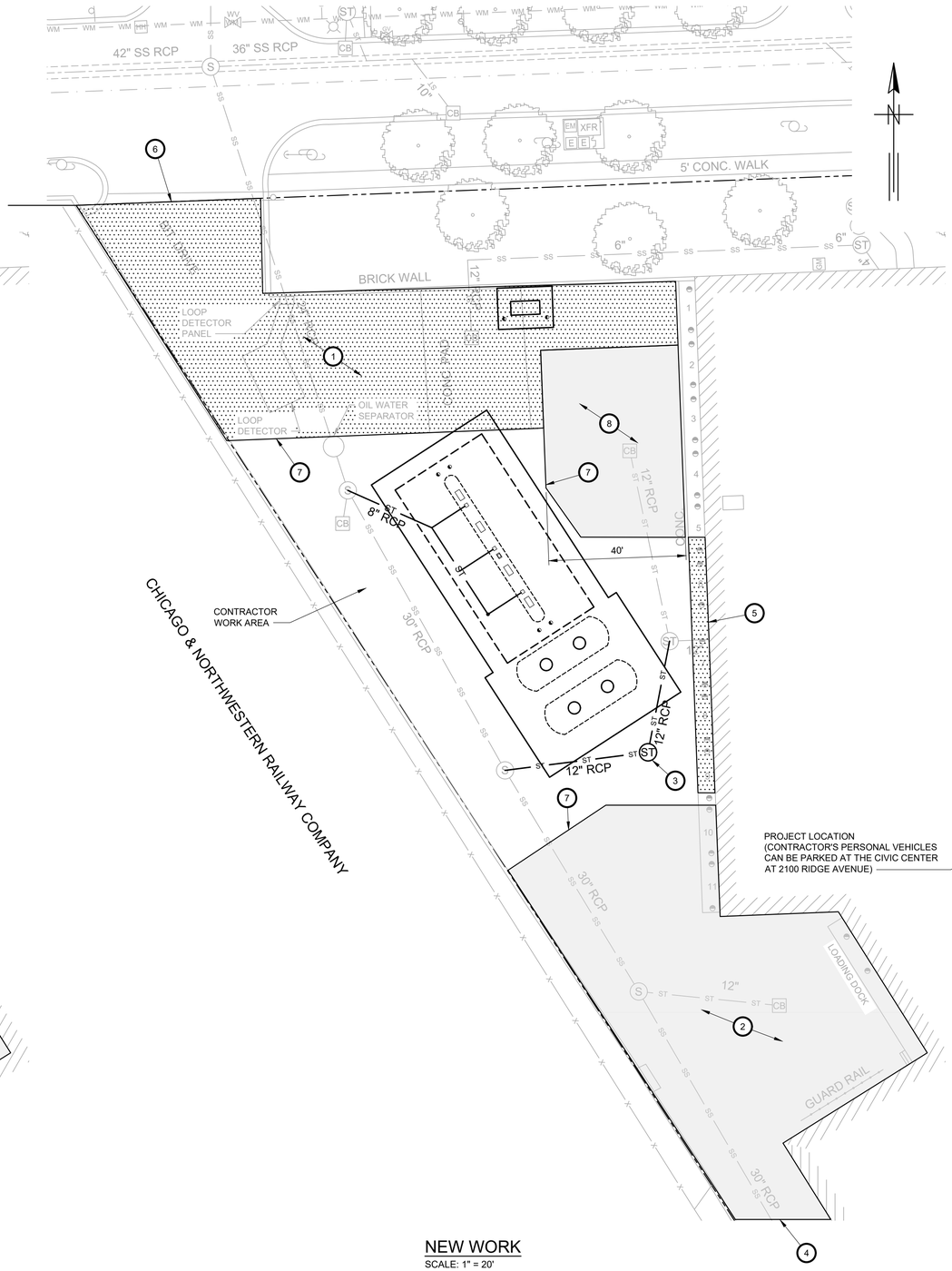
DRAWING INDEX, LOCATION MAP,
GENERAL NOTES AND ABBREVIATIONS

PROJECT NO.: 00280
DWG: G01
SHEET: 1 OF 20
DATE: DEC 2023 REV: 0



DEMOLITION

SCALE: 1" = 20'



NEW WORK

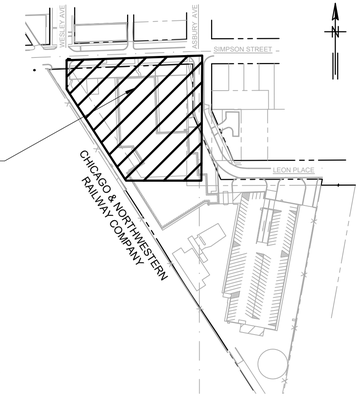
SCALE: 1" = 20'

DEMOLITION PHASE CONSTRAINTS

1. CONTRACTOR WORK AREA. CONTRACTOR TO PROVIDE ACCESS TO CITY PERIODICALLY IF/AS THEY ARE ABLE TO ACCOMMODATE IT.
2. OWNER ACCESS ONLY.
3. THE TIME BETWEEN REMOVAL OF THE EXISTING FUELING SYSTEM AND INSTALLATION OF THE NEW FUELING SYSTEM MUST BE MINIMIZED. CONSTRUCTION SCHEDULE SHALL BE APPROVED BY THE CITY PRIOR TO COMMENCEMENT.
4. NO CONTRACTOR VEHICLE ACCESS FROM THE SOUTH UNLESS BY CITY APPROVAL.
5. CITY TO MANAGE OPERATION, ACCESSIBILITY, AND SECURITY OF BAY DOORS AND PERSON-DOOR. CONTRACTOR TO COORDINATE WORK NEAR THE DOORS.
6. CONTRACTOR SITE ACCESS. CONTRACTOR TO PROVIDE SIGNAGE TO REROUTE DELIVERY TRAFFIC TO ASBURY AVENUE.
7. CONTRACTOR MUST INSTALL CONSTRUCTION FENCING AND GATE ACCESS AROUND THE WORK AREA
8. OWNER ACCESS ONLY (EXCEPT WHEN CONTRACTOR NEEDS TO CONNECT PIPING TO BUILDING A OR SIMILAR ACTIVITIES)

NEW WORK PHASE CONSTRAINTS

1. CONTRACTOR WORK AREA. CONTRACTOR TO PROVIDE ACCESS TO CITY PERIODICALLY IF/AS THEY ARE ABLE TO ACCOMMODATE IT.
2. OWNER ACCESS ONLY.
3. NEW MANHOLE AND PIPING INSTALLATION SHALL NOT INTERRUPT THE EXISTING DRAIN SYSTEM OPERATION.
4. NO CONTRACTOR VEHICLE ACCESS FROM THE SOUTH UNLESS BY CITY APPROVAL.
5. CITY TO MANAGE OPERATION, ACCESSIBILITY, AND SECURITY OF BAY DOORS AND PERSON-DOOR. CONTRACTOR TO COORDINATE WORK NEAR THE DOORS.
6. CONTRACTOR SITE ACCESS. CONTRACTOR TO PROVIDE SIGNAGE TO REROUTE DELIVERY TRAFFIC TO ASBURY AVENUE.
7. CONTRACTOR MUST INSTALL CONSTRUCTION FENCING AND GATE ACCESS AROUND THE WORK ARE
8. OWNER ACCESS ONLY (EXCEPT WHEN CONTRACTOR NEEDS TO CONNECT PIPING TO BUILDING A OR SIMILAR ACTIVITIES)



LOCATION MAP

NOT TO SCALE

NOTES:

1. THE CONTRACTOR SHALL SUBMIT A PHASING PLAN DEMONSTRATING THE CONSTRAINTS WILL BE MAINTAINED DURING CONSTRUCTION.
2. THE CONTRACTOR SHALL COORDINATE WITH THE CITY AND OBTAIN APPROVAL FOR ANY ACCESS OR SPACE NEEDED THAT WILL PREVENT CLEARANCE FOR SERVICE CENTER OPERATIONS.

BID SET

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED BW
DRAWN GS
CHECKED MD

MICHAEL A. DERNAT
062.066817
LICENSED PROFESSIONAL ENGINEER
OF
SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE
20 0 20 40 FT
1"=20'

CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

GENERAL

CONSTRUCTION CONSTRAINTS

PROJECT NO.: 00280
DWG: G02
SHEET: 2 OF 20
DATE: DEC 2023 REV: 0

HATCH LEGEND

EXISTING

- GRADING RIP RAP
- GRAVEL (PLAN VIEW)
- CONCRETE (SECTION VIEW)
- CONCRETE (PLAN VIEW)
- PAVEMENT

NEW

- GRADING RIP RAP
- GRAVEL (PLAN VIEW)
- CONCRETE (SECTION VIEW)
- CONCRETE (PLAN VIEW)
- PAVEMENT
- LIMITS OF DEMOLITION

MISCELLANEOUS SITE LINES

EXISTING

- 10 MAJOR CONTOUR (5 FT INTERVAL)
- 9 MINOR CONTOUR (1 FT CONTOUR)
- X FENCELINE X (CHAINLINK)
- FENCELINE BOX (METAL/WOOD POST)
- FENCELINE CIRCLE (GUARDRAIL)
- TOP OF BANK (TYPE 1)
- TOE OF SLOPE (TYPE 1)
- TOB TOP OF BANK (TYPE 2)
- TOE TOE OF SLOPE (TYPE 2)
- CHANNEL FLOW (TYPE 1)
- CHANNEL FLOW 2 (TYPE 2)
- TREELINE
- TRACKS (TYPE 1)
- TRACKS (TYPE 2)
- TRACKS (TYPE 3)

NEW

- 10 MAJOR CONTOUR (5 FT INTERVAL)
- 8 MINOR CONTOUR (1 FT CONTOUR)
- X FENCELINE X (CHAINLINK)
- FENCELINE BOX (METAL/WOOD POST)
- FENCELINE CIRCLE (GUARDRAIL)
- TOP OF BANK (TYPE 1)
- TOE OF SLOPE (TYPE 1)
- TOB TOP OF BANK (TYPE 1)
- TOE TOE OF SLOPE (TYPE 1)
- TOB TOP OF BANK (TYPE 2)
- TOE TOE OF SLOPE (TYPE 2)
- CHANNEL FLOW (TYPE 1)
- CHANNEL FLOW 2 (TYPE 2)
- LIMITS OF CONSTRUCTION (TYPE 1)
- LOC LIMITS OF CONSTRUCTION (TYPE 2)
- LOD LIMITS OF DISTURBANCE

THREE LINE YARD PIPING

EXISTING

- BURIED PIPE
- ABOVE GROUND PIPE

NEW

- BURIED PIPE
- ABOVE GROUND PIPE

JURISDICTION LINES

- PROPERTY LINE
- RIGHT OF WAY LINE
- QUARTER/SECTION LINE
- EASEMENT

CONSTRUCTION KEY NOTES

- 1 DEMOLITION KEY NOTE
- 1 NEW CONSTRUCTION KEY NOTE

SINGLE LINE YARD PIPE

EXISTING		NEW	
UC	UNDERGROUND COMMUNICATION	UC	UNDERGROUND COMMUNICATION
UE	UNDERGROUND ELECTRIC	UE	UNDERGROUND ELECTRIC
UF	UNDERGROUND FIBER OPTIC	UF	UNDERGROUND FIBER OPTIC
UT	UNDERGROUND TELEPHONE	UT	UNDERGROUND TELEPHONE
UTV	UNDERGROUND TV	UTV	UNDERGROUND TV
OC	OVERHEAD COMMUNICATION	OC	OVERHEAD COMMUNICATION
OE	OVERHEAD ELECTRIC	OE	OVERHEAD ELECTRIC
OF	OVERHEAD FIBER OPTIC	OF	OVERHEAD FIBER OPTIC
OT	OVERHEAD TELEPHONE	OT	OVERHEAD TELEPHONE
OTV	OVERHEAD TV	OTV	OVERHEAD TV
UNK	UNKNOWN UTILITY	UNK	UNKNOWN UTILITY
TS	TRAFFIC SIGNAL	TS	TRAFFIC SIGNAL
IR	IRRIGATION MAIN	IR	IRRIGATION MAIN
GM	GAS MAIN	GM	GAS MAIN
WM	WATER MAIN	WM	WATER MAIN
FM	FORCE MAIN	FM	FORCE MAIN
ST	STORM SEWER	ST	STORM SEWER
	STORM SEWER (OPTIONAL FOR LARGE DIAMETER)		STORM SEWER (OPTIONAL FOR LARGE DIAMETER)
SS	SANITARY SEWER	SS	SANITARY SEWER
CS	COMBINED SEWER	CS	COMBINED SEWER
IS	INTERCEPTOR SEWER	IS	INTERCEPTOR SEWER
D	PLANT DRAIN	D	PLANT DRAIN
CW	CITY WATER/CHILL WATER	CW	CITY WATER/CHILL WATER
PW	PLANT WATER	PW	PLANT WATER
HW	HOT WATER	HW	HOT WATER
			HORIZONTAL DIRECTIONAL DRILL (HDD)

EROSION AND SEDIMENT CONTROL LEGEND

- CD ROCK CHECK DAM
- TP TREE PROTECTION
- TR TREE REMOVAL
- IP INLET PROTECTION
- IR INLET REMOVAL
- CIP CULVERT INLET PROTECTION
- SF SILT FENCE
- SAF SAFETY FENCE
- FD TEMPORARY FILL DIVERSION
- MU MULCHING (EXTENDS)
- PS PERMANENT SEEDING (EXTENDS)
- TS TEMPORARY SEEDING (EXTENDS)
- CE CONSTRUCTION ENTRANCE
- DC DUST CONTROL
- BT BARRIER TAPE
- TC TURBIDITY CURTAIN
- LIMITS OF DISTURBANCE
- TREE PROTECTION LIMITS
- IP IP INLET PROTECTION BARRIER
- TP TP TREE PROTECTION BARRIER
- X X X X SILTFENCE (TYPE 1)
- SF SF SF SILTFENCE (TYPE 2)
- X R X R X R SILTFENCE AND REPTILE FENCE
- R R R R REPTILE FENCE
- RMA LIMITS
- RPA LIMITS
- TEMPORARILY IMPACTED WETLAND
- WETLAND CONVERSION IMPACT

SOIL LEGEND

- SOIL BOUNDARY
- 37B TURBEVILLE FINE SANDY LOAM
- 40 UDORTHENTS-DUMPS COMPLEX

CIVIL SITE SYMBOLS

NOTE:
SCREENED (GREY) LINES DEPICT EXISTING ITEMS ON PLANS AND DARK (BLACK) LINES DEPICT NEW ITEMS ON PLANS.

- GENERAL MANHOLE (TO BE USED AS NEW)
- GENERAL MANHOLE (TO BE USED AS EXISTING)
- S SANITARY MANHOLE
- SANITARY CLENOUT
- CS COMBINED SEWER MANHOLE
- OC ODOR CONTROL MANHOLE
- T TELEPHONE MANHOLE
- E ELECTRICAL MANHOLE
- ST STORM MANHOLE
- CB CATCH BASIN
- PB PULL BOX
- PH# POT HOLE
- BOLLARD
- LIGHT POST
- FIRE HYDRANT
- FIRE DEPARTMENT CONNECITON
- WV WATER VALVE
- GV GAS VALVE
- ICV IRRIGATION VALVE
- W WATER MANHOLE/WET WELL
- GENERAL BURIED VALVE
- AIR RELEASE VALVE
- BLOW OFF VALVE
- WATER HOUSE SERVICE
- SEWER HOUSE SERVICE
- VERTICAL BENDS (PLAN VIEW)
- PIPE BREAK
- PIPELINE CAP
- PARKING CURB
- REDUCER
- W WATER METER
- WVL WATER VAULT
- ABOVE GROUND BACKFLOW PREVENTER
- GM GAS METER
- E ELECTRIC JUNCTION BOX
- EM ELECTRIC METER
- XFR TRANSFORMER
- AC AIR CONDITIONING UNIT
- T TELEPHONE JUNCTION BOX
- TS TRAFFIC SIGNAL JUNCTION BOX
- NEW GRADING FLOW AREA
- EXISTING GRADING FLOW AREA
- STREET LIGHT
- TRAFFIC SIGNAL (NO ARM)
- TRAFFIC SIGNAL (WITH ARM)
- HH UTILITY HANDHOLE
- SIGN
- BRASS CAP
- BRASS CAP IN HANDHOLE
- SURVEY MONUMENT (AS NOTED)
- SB# SOIL BORING
- CP# CONTROL POINT
- WOODEN POWER POLE
- STEEL OR CONCRETE POWER POLE
- GUY WIRE
- GRADE BREAK

BID SET

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED DA
DRAWN RAM
CHECKED PEH

MICHAEL A. DEBNAR 062.066817 LICENSED PROFESSIONAL ENGINEER OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

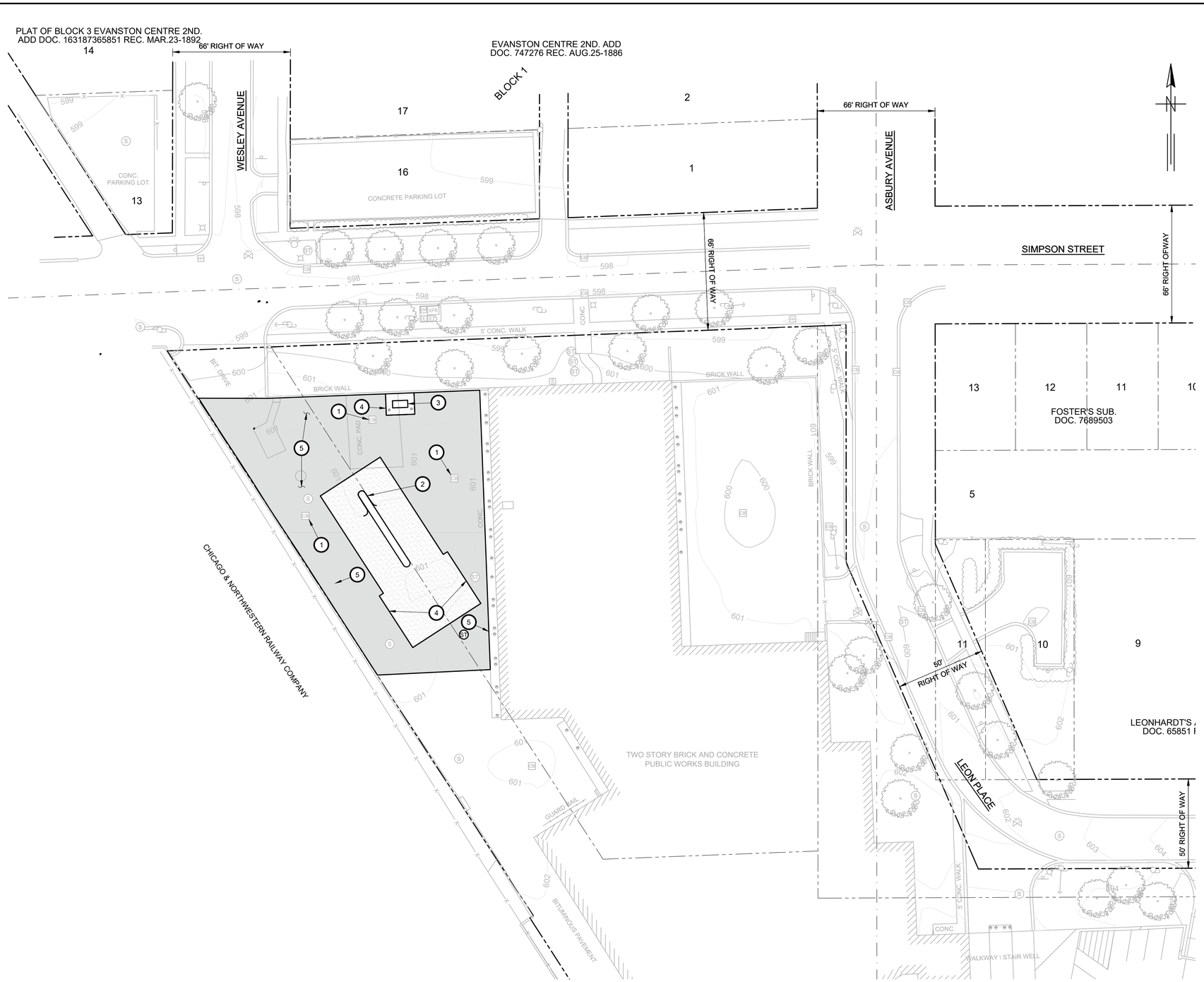
NO.	DATE	APPD	REVISION DESCRIPTION

SCALE: NO SCALE

CITY OF EVANSTON, ILLINOIS
SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

CIVIL
SYMBOL LEGEND

PROJECT NO.: 00280
DWG: C01
SHEET: 3 OF 20
DATE: DEC 2023 REV: 0



GRADING AND RESTORATION PLAN

SCALE: 1" = 30'

NEW CONSTRUCTION KEY NOTES

1. PROVIDE INLET PROTECTOR PER DETAIL 7/C04
2. REGRADE AROUND CURB SO THAT THE GRADE AT THE BASE OF THE CURB IS AT 601'.
3. CONCRETE EQUIPMENT PAD ELEVATED ABOVE GRADE, SEE DETAIL 2/S04.
4. INSTALL NEW CONCRETE PAVEMENT, SEE DETAIL 2/C04, DETAIL 3/C04, AND DETAIL 4/C04.
5. IN THE SHADED AREA, MILL THE TOP 3" OF THE EXISTING ASPHALT COVER AND LEAVE THE UNDERLYING SUBBASE INTACT. THOROUGHLY SWEEP THE MILLED AREA TO MAKE A SMOOTH SERVICE FOR PAVING. REPAVE SHADED AREA WITH ASPHALT TO REFLECT THE GRADES SHOWN ON THIS DRAWING.

NOTES:

1. CONTRACTOR TO VERIFY VERTICAL AND HORIZONTAL LOCATIONS OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.

BID SET

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED	DA	
DRAWN	RAM	
CHECKED	PEH	

MICHAEL A. DEBNAR 062.066817 LICENSED PROFESSIONAL ENGINEER OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE
30 0 30 60 FT
1"=30'

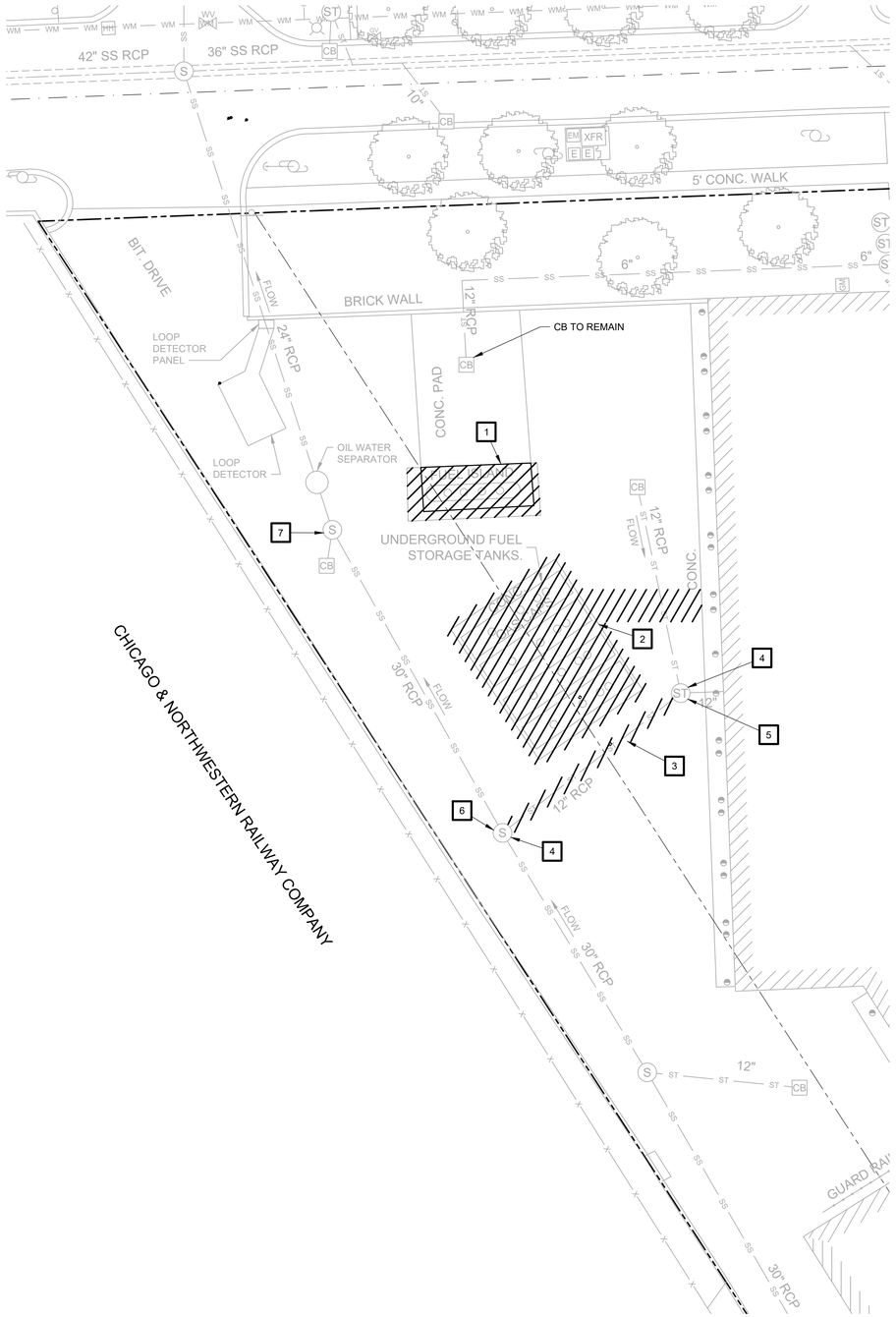
CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

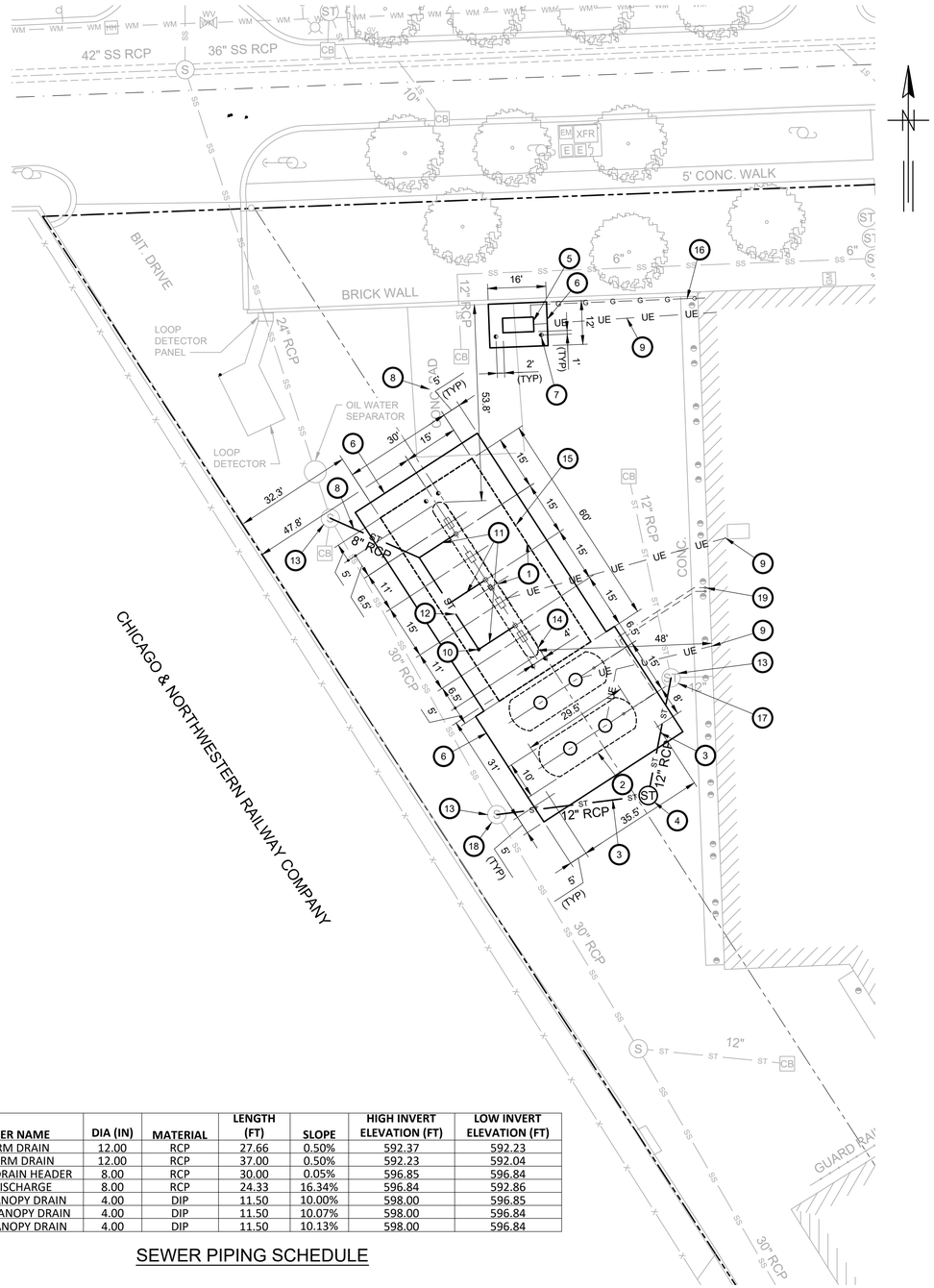
CIVIL

GRADING AND RESTORATION PLAN

PROJECT NO.: 00280
DWG: C02
SHEET: 4 OF 20
DATE: DEC 2023 REV: 0



YARD PIPING PLAN
DEMOLITION
SCALE: 1" = 20'



YARD PIPING PLAN
NEW WORK
SCALE: 1" = 20'

SEWER NAME	DIA (IN)	MATERIAL	LENGTH (FT)	SLOPE	HIGH INVERT ELEVATION (FT)	LOW INVERT ELEVATION (FT)
EAST STORM DRAIN	12.00	RCP	27.66	0.50%	592.37	592.23
WEST STORM DRAIN	12.00	RCP	37.00	0.50%	592.23	592.04
CANOPY DRAIN HEADER	8.00	RCP	30.00	0.05%	596.85	596.84
HEADER DISCHARGE	8.00	RCP	24.33	16.34%	596.84	592.86
SOUTH CANOPY DRAIN	4.00	DIP	11.50	10.00%	598.00	596.85
MIDDLE CANOPY DRAIN	4.00	DIP	11.50	10.07%	598.00	596.84
NORTH CANOPY DRAIN	4.00	DIP	11.50	10.13%	598.00	596.84

SEWER PIPING SCHEDULE

DEMOLITION KEY NOTES

1. DEMOLISH THE FUEL ISLAND AND CONCRETE PAD. REMOVE ALL MECHANICAL AND ELECTRICAL COMPONENTS OF THE EXISTING FUEL ISLAND (INCLUDING FUEL DISPENSERS AND LIGHT POLES) PER THE MECHANICAL AND ELECTRICAL DEMOLITION DRAWINGS.
2. EVACUATE AND DEMOLISH THE UNDERGROUND FUEL STORAGE TANKS AND CONCRETE ANCHOR PAD.
3. DEMOLISH THE 12" RCP STORM SEWER.
4. GROUT THE OPENING IN THE MANHOLE FOR THE PIPE BEING DEMOLISHED. REMOVE ANY CHANNELING IN THE BOTTOM OF THE MANHOLE THAT DIRECTS FLOW TO THE GROUTED OPENING.
5. MANHOLE INVERT ELEVATIONS:
   RIM - 600.92
   INV 595.92 E
   INV 592.37 W - SEE DEMOLITION KEY NOTE 4
   INV 592.72 N
6. MANHOLE INVERT ELEVATIONS:
   RIM - 600.84
   INV 591.66 N
   INV 592.04 E - SEE DEMOLITION KEY NOTE 4
   INV 592.04 S
7. MANHOLE INVERT ELEVATIONS:
   RIM - 600.16
   INV 591.36 N,S
   INV 593.89 W

NEW CONSTRUCTION KEY NOTES

1. INSTALL NEW FUEL ISLAND AND PRE-ENGINEERED CANOPY.
2. INSTALL NEW UNDERGROUND FUEL STORAGE TANKS.
3. INSTALL NEW 12" RCP STORM SEWER AND PAVEMENT, SEE DETAILS 8/C04 AND 1/C04 RESPECTIVELY.
4. INSTALL NEW 4' DIAMETER STORM SEWER MANHOLE, SEE DETAIL 6/C04. RIM ELEVATION SHALL BE FLUSH WITH GRADE, BOTH THE EAST INVERT ELEVATION AND THE WEST INVERT ELEVATION SHALL BE 592.23.
5. INSTALL NEW GENERATOR ENCLOSURE. PROVIDE CONCRETE PAD, SEE STRUCTURAL DRAWINGS
6. INSTALL NEW CONCRETE PAVEMENT, SEE DETAIL 2/C04, DETAIL 3/C04, AND DETAIL 4/C04.
7. INSTALL BOLLARD, SEE DETAIL 5/C04.
8. INSTALL NEW PAVEMENT, SEE DETAIL 1/C04. ALL DISTURBED AREAS OUTSIDE OF THE CONCRETE PAVEMENT SHOWN ARE TO BE RESTORED WITH ASPHALT.
9. INSTALL ELECTRICAL DUCTBANK, SEE E03.
10. INSTALL NEW 4" X 8" X 8" TEE AND 8" ELBOW WITH A 8" DIP CLEAN OUT RISING FROM THE NORTH END OF THE TEE. INSTALL REMOVABLE CAP ON CLEANOUT THAT IS FLUSH WITH GRADE.
11. INSTALL NEW 4" RCP STORM SEWER APPROXIMATELY 3' BELOW GRADE. CONNECT TO THE 3" STORM DRAIN IN THE CENTER OF THE COLUMNS SUPPORTING THE RE-ENGINEERED CANOPY. SLOPE TO MEET THE 8" HEADER. THE UPSTREAM INVERT ELEVATIONS OF THE CONNECTIONS TO THE 3" STORM DRAIN SHALL BE 598.
12. INSTALL NEW 8" RCP STORM SEWER. THE SOUTH INVERT ELEVATION SHALL BE 596.85 AT THE CLEANOUT AND THE NORTH INVERT ELEVATION SHALL BE 596.84. THE CONNECTION TO THE STORM SEWER SHALL BE 592.86.
13. RECHANNEL THE EXISTING MANHOLE TO REFLECT UPDATED PIPE LAYOUT AND FLOW PATHES.
14. USE A 2' RADIUS FOR THE CURVES ON EACH END OF THE CURB. THE ENTIRE CURB SHALL BE PROTECTED WITH A STEEL FACE AS SHOWN ON DETAIL 9, SHEET C04.
15. INSTALL PRE-ENGINEERED CANOPY, SEE DETAIL 1/M05 AND 2/M05.
16. INSTALL NEW GAS LINE PER M03.
17. NEW STORM SEWER INVERT ELEVATION SHALL BE 592.37.
18. NEW STORM SEWER INVERT ELEVATION SHALL BE 592.04.
19. INSTALL TANK VENT PIPES PER M03.

NOTES:

1. CONTRACTOR TO VERIFY VERTICAL AND HORIZONTAL LOCATIONS OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.

BID SET

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED DA
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CHECKED PEH

MICHAEL A. DEBNAR
062.066817
LICENSED PROFESSIONAL ENGINEER
OF
ILLINOIS
SEAL AFFIXED 12-08-2023
EXP. 11-30-2025

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE
20 0 20 40 FT
1"=20'

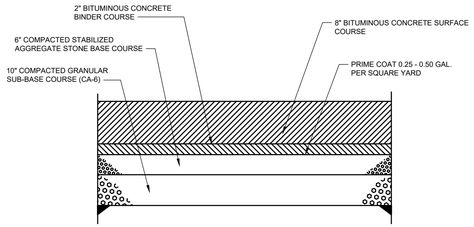
CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

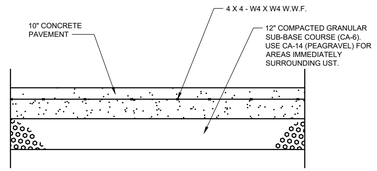
CIVIL

YARD PIPING PLANS - DEMOLITION AND NEW WORK

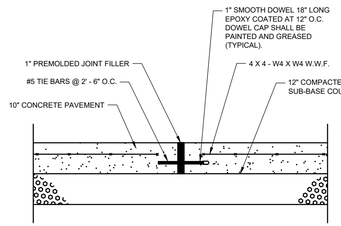
PROJECT NO.: 00280
DWG: C03
SHEET: 5 OF 20
DATE: DEC 2023 REV: 0



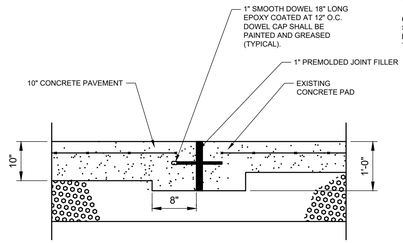
DETAIL 1/C04
FLEXIBLE PAVEMENT FOR PARKING
SCALE: NOT TO SCALE



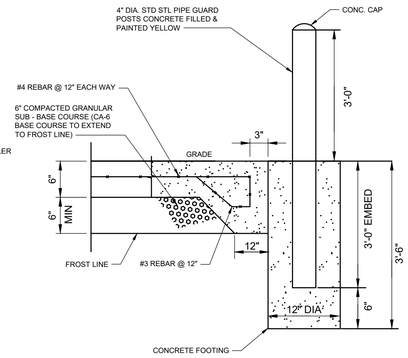
DETAIL 2/C04
CONCRETE PAVEMENT
SCALE: NOT TO SCALE



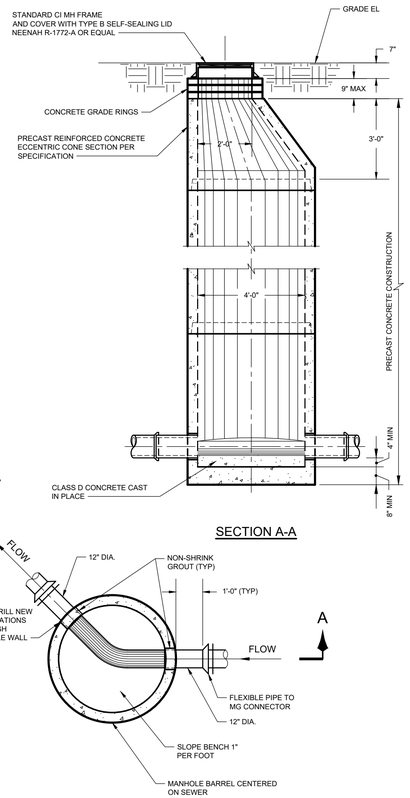
DETAIL 3/C04
CONCRETE EXPANSION JOINT
SCALE: NOT TO SCALE



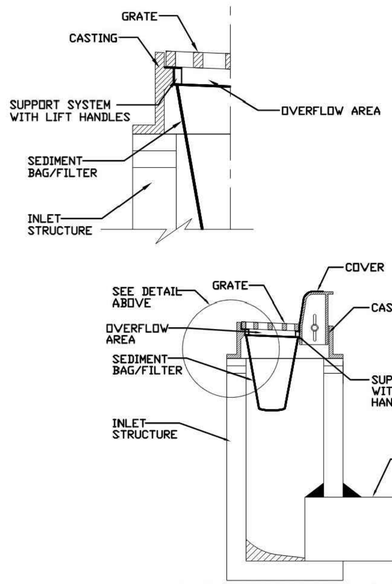
DETAIL 4/C04
SLAB DOWEL
SCALE: NOT TO SCALE



DETAIL 5/C04
BOLLARD
SCALE: NOT TO SCALE



DETAIL 6/C04
STORM MANHOLE
SCALE: NOT TO SCALE



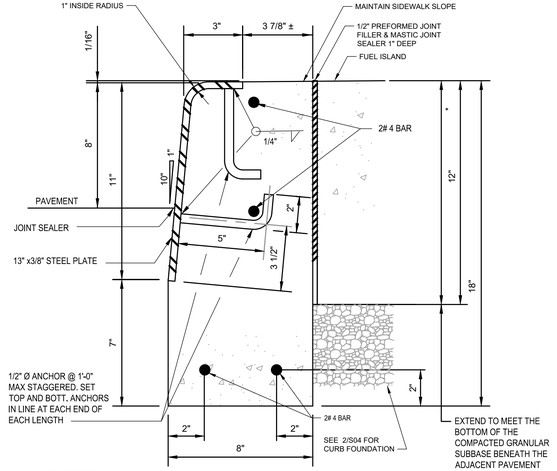
DETAIL 7/C04
INLET PROTECTION
SCALE: NOT TO SCALE

SEE DETAIL 1 FOR DEPTH

(WHERE APPLICABLE)

NOTES:
1. SAWCUT SHALL NOT EXTEND BEYOND CORNER OF PAVEMENT PARCH AND ALL EDGES CRACK SEALED.
2. DOWELS TO BE USED WHEN EXISTING BASE IS CONCRETE.
3. DOWELS MUST BE EPOXY COATED.
4. BACKFILL FOR PIPE MUST USE GRANULAR BACKFILL TO A LEVEL OF 12-INCH 9MINIMUM) OVER THE TOP OF THE PIPE.
5. TRENCH BACKFILL IS TO BE COMPACTED EVERY LIFT. EACH LIFT SHALL BE A MAXIMUM OF 12".

DETAIL 8/C04
SEWER TRENCH
SCALE: NOT TO SCALE



NOTES:
1. STRUCTURAL STEEL AS PER ASTM A-36 FOR STEEL FACED CURB

DETAIL 9/C04
STEEL FACED CURB DETAIL
SCALE: NOT TO SCALE

BID SET

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED	DA	
DRAWN	RAM	
CHECKED	PEH	

MICHAEL A. DERMAN 062.066817 LICENSED PROFESSIONAL ENGINEER OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE: NOT TO SCALE

CITY OF EVANSTON, ILLINOIS
SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

CIVIL
DETAILS

PROJECT NO.: 00280
DWG: C04
SHEET: 6 OF 20
DATE: DEC 2023 REV: 0

GENERAL NOTES

CODES AND DESIGN CRITERIA

1. PERFORM ALL CONSTRUCTION IN CONFORMANCE WITH THE BUILDING AND DESIGN CODES REFERENCED WITHIN THESE DOCUMENTS. THE PROJECT DOCUMENTS REFER TO THE FOLLOWING CODES AND STANDARDS, UON:
   INTERNATIONAL BUILDING CODE – 2021 AND CITY AMENMENTS
   ASCE7–2016
   CONCRETE:
   "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE"
   THE AMERICAN CONCRETE INSTITUTE (ACI 318–2019)
   STEEL:
   "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS"
   AMERICAN INSTITUTE OF STEEL (AISC 360–2016)

2. ROOF LIVE LOADS : 20 PSF
3. SNOW LOADS (PER IBC 2021):
   GROUND SNOW LOAD Pg 25PSF. DRIFT SHALL BE CONSIDERED BY SUPERSTRUCTURE ENGINEERS.

4. WIND LOAD DESIGN DATA (ASCE7–2016) (ULTIMATE WIND LOAD):
   WIND SPEED: 107 MPH
   IMPORTANCE FACTOR: 1.0
   EXPOSURE CATEGORY: B
   MAIN ROOF HEIGHT: 20'
   WIND DIRECTIONALITY FACTOR: Kd=0.85
   MAIN WIND FORCE RESISTING SYSTEM WIND PRESSURE: 25 PSF
   UPLIFT: 17 PSF

5. SEISMIC DESIGN:
   SEISMIC RISK CATEGORY: II
   IMPORTANCE FACTOR: 1.0
   Ss=0.112G
   S1=0.063G
   SITE CLASS: D
   SDS = 0.12 G
   SD1 = 0.1 G
   SEISMIC DESIGN CATEGORY: B

8. SERVICEABILITY
   LIVE LOAD DEFLECTION IS LESS THAN L/360
   LONG–TERM TOTAL DEFLECTION IS LESS THAN L/240
   EXTERIOR SPANDRELS HAVE BEEN DESIGNED TO LIMIT LIVE LOAD MIDSPAN VERTICAL DEFLECTION TO 1/360 OF THE SPAN OR 1/2", WHICHEVER IS LESS.
   OUT OF PLANE DEFLECTION FOR BRICK VENEER AND STONE VENEER L/600.
9. IF INCONSISTENCY IS DISCOVERED BETWEEN SPECIFICATION AND DRAWINGS, DRAWINGS SHALL GOVERN.
10. THE CANOPY SUPERSTRUCTURE SHALL BE DESIGNED BY CONTRACTOR'S OWN STRUCTURAL ENGINEER LICENSED IN STATE OF ILLINOIS.

GENERAL REQUIREMENTS

1. AS USED IN THESE GENERAL NOTES:
   a. DRAWINGS MEANS THE LATEST STRUCTURAL DESIGN DRAWINGS, UON.
   b. SPECIFICATIONS MEANS THE LATEST PROJECT SPECIFICATIONS, UON.
   c. CONTRACT DOCUMENTS IS DEFINED AS THE DESIGN DRAWINGS AND THE SPECIFICATIONS.
   d. SER IS DEFINED AS THE STRUCTURAL ENGINEER OF RECORD FOR THE STRUCTURE IN ITS FINAL CONDITION.
   e. DESIGN PROFESSIONALS IS DEFINED AS THE ARCHITECT AND SER.
   f. MEP INCLUDES, BUT IS NOT LIMITED TO MECHANICAL, ELECTRICAL, PLUMBING, AND FIRE PROTECTION.
   g. CONTRACTOR IS DEFINED TO INCLUDE ANY OF THE FOLLOWING: GENERAL CONTRACTOR AND THEIR SUBCONTRACTORS, CONSTRUCTION MANAGER AND THEIR SUBCONTRACTORS, STRUCTURAL STEEL FABRICATOR OR STRUCTURAL STEEL ERECTOR.
   h. BASE BUILDING STRUCTURE IS DEFINED AS THE STRUCTURAL FRAME DESIGN
   i. STRUCTURE IN ITS FINAL CONDITION MEANS ALL STRUCTURAL ELEMENTS SHOWN ON THE STRUCTURAL CONTRACT DOCUMENTS ARE INSTALLED AND COMPLETELY CONNECTED AND INSPECTED WITH NO OUTSTANDING NON–COMPLIANCE ISSUES
2. AS NOTED IN THESE NOTES, THE 'ENGINEER' SHALL REFER TO CCJM, CONSULTING ENGINEERS.
3. THE CONTRACTOR SHALL COMPLY WITH THE LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY BEARING UPON THE PERFORMANCE OF THE WORK.
4. EXISTING CONDITIONS AND RELATED DIMENSIONS INDICATED ON THE CONTRACT DOCUMENTS SHALL BE FIELD VERIFIED PRIOR TO IMPLEMENTING THE WORK. CONDITIONS THAT DIFFER FROM THOSE INDICATED IN THE CONTRACT DOCUMENTS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW AND APPROVAL PRIOR TO IMPLEMENTING THE WORK.
5. THE STRUCTURAL DRAWINGS REPRESENT THE FINISHED STRUCTURE AND, UNLESS NOTED OHERWISE, DO NOT INDICATE THE METHOD OF CONSTRUCTION.
6. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF THE STRUCTURAL WORK WITH THE ARCHITECTURAL, CIVIL, MEP CONTRACT DOCUMENTS, AS WELL AS ANY OTHER APPLICABLE TRADES.
7. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE UNTIL THE CONSTRUCTION OF THE STRUCTURE REACHES ITS FINAL CONDITION.
8. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE DESIGN, INSTALLATION, AND REMOVAL OF TEMPORARY BRACING AND CONSTRUCTION SUPPORTS, FOR NEW STRUCTURES, AS NECESSARY TO COMPLETE THE PROJECT. NO PORTION OF THE PROJECT WHILE UNDER CONSTRUCTION IS INTENDED TO BE STABLE IN THE ABSENCE OF THE CONTRACTOR'S TEMPORARY SUPPORTS AND BRACES. CONTRACTOR SHALL RETAIN A STRUCTURAL ENGINEER LICENSED IN ILLINOIS TO DESIGN TEMPORARY BRACING AND CONSTRUCTION SUPPORTS.
9. THE SPECIFICATIONS ARE AN INTEGRAL PART OF THE CONTRACT DOCUMENTS AND SHALL BE USED IN
   CONJUNCTION WITH THE STRUCTURAL DRAWINGS.
10. THE CONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS AND COORDINATE WITH THE STRUCTURAL DRAWINGS, ARCHITECTURAL DRAWINGS, DRAWINGS FROM OTHER CONSULTANTS, PROJECT SHOP DRAWINGS AND FIELD CONDITIONS.
11. IN CASES OF CONFLICT BETWEEN DRAWINGS AND/OR SPECIFICATIONS AND OTHER DISCIPLINES OR EXISTING CONDITIONS, CONTRACTOR SHALL NOTIFY THE DESIGN PROFESSIONALS AND OBTAIN CLARIFICATION PRIOR TO BIDDING AND PROCEEDING WITH WORK. .
12. ONLY USE DIMENSIONS INDICATED ON THE DRAWINGS. DO NOT SCALE DRAWINGS.
13. CONTRACTOR TO CONSIDER DECK SLAB DEFLECTION WHEN COORDINATING AVAILABLE CEILING SPACE FOR MEP WORK.
14. CENTERLINES OF COLUMNS AND FOUNDATIONS COINCIDE WITH GRID LINE INTERSECTIONS, UON.
15. CENTERLINES OF GRADE BEAMS AND WALLS COINCIDE WITH CENTERLINES OF FOUNDATIONS, UON.
16. CENTERLINES OF FRAMING MEMBERS COINCIDE WITH COLUMN CENTERLINES, UON.
17. THE CONTRACTOR SHALL PROTECT EXISTING FACILITIES, STRUCTURES AND UTILITIES FROM DAMAGE.
18. THE CONTRACTOR SHALL VERIFY THAT CONSTRUCTION LOADS DO NOT EXCEED THE CAPACITY OF THE STRUCTURE AT THE TIME THE LOAD IS APPLIED.

19. THE CONTRACTOR SHALL COORDINATE THE ELEVATIONS WITH THE AS–BUILT CONDITIONS.
20. THE CONTRACTOR SHALL VERIFY ALL OPENING SIZES AND LOCATIONS WITH OTHER DISCIPLINES. THE DRAWINGS DO NOT SHOW ALL OPENINGS REQUIRED. ADDITIONAL OPENINGS, BLOCKOUTS AND SLEEVES MAY BE REQUIRED BY OTHER DISCIPLINES AND SHALL BE CONSTRUCTED USING THE TYPICAL DETAILS AND/OR THE CRITERIA INDICATED ON THE DRAWINGS. OPENINGS REQUIRED BUT NOT SHOWN ON THE STRUCTURAL DRAWINGS MUST BE APPROVED BY THE STRUCTURAL ENGINEER.
21. SEE ARCHITECTURAL, AND MEP CONTRACT DOCUMENTS FOR ADDITIONAL INFORMATION RELATING
    TO THE COORDINATION OF STRUCTURAL COMPONENTS INCLUDING, BUT NOT LIMITED TO:

ARCHITECTURAL:
PLAN DIMENSIONS AND PROJECT DATUM
SLAB EDGE DIMENSIONS
FINISH ELEVATIONS
RAMP GEOMETRY, PITS, SLAB SLOPES AND DEPRESSIONS
EMBEDMENTS, INSERTS, BLOCKOUTS, ETC.
EXACT OPENING SIZES FOR PIPES, DUCTS, ETC.
CONCRETE FINISHES AND TOPPING SLABS
FIRE PROTECTION FOR STRUCTURAL MEMBERS.

FOUNDATIONS

THE FOUNDATION IS DESIGNED BASED ON GEOTECHNICAL REPORT BY O'BRIEN AND ASSOCIATES JOB NO. 23103 DATED 05/03/2023. ALLOWABLE SOIL BEARING PRESSURE 2000 PSF.

1. THE SOIL SUBGRADE FOR ALL SOIL SUPPORTING SLABS SHALL BE INSPECTED AND APPROVED BY QUALIFIED GEOTECHNICAL ENGINEER IMMEDIATELY PRIOR TO PLACING FOUNDATION CONCRETE OR CONCRETE MUD SLABS. CONTRACTOR TO INCLUDE COST IN BID PRICE FOR THIS SERVICE.
2. THE UPPER 12 INCHES OF ALL SLAB SUBGRADES, INCLUDING PIT SLABS, SHALL BE COMPACTED TO 95 PERCENT OF MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT (ASTM D1557). ALL BACKFILL AROUND AND ABOVE ALL FOUNDATION ELEMENTS, FOOTINGS, CAPS, MATS, WALLS AND PITS SHALL BE PLACED IN LAYERS NOT TO EXCEED 8 INCHES IN THICKNESS AND SHALL BE COMPACTED TO 90 PERCENT OF THE MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT (ASTM D1557) TO WITHIN 12 INCHES OF THE SLAB SUBGRADE.
3. ALL ORGANIC AND/OR OTHER UNSUITABLE MATERIALS SHALL BE REMOVED FROM FOUNDATION AND SLAB SUBGRADES AND BACKFILL AREAS, AND THEN BACKFILLED WITH ACCEPTABLE GRANULAR FILL COMPACTED TO 95 PERCENT OF MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT (ASTM D1557)
4. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY MEASURES TO PREVENT ANY WATER, FROST, OR ICE FROM PENETRATING ANY FOUNDATION OR STRUCTURAL SLAB SUBGRADE BEFORE AND AFTER PLACING OF CONCRETE AND UNTIL SUCH SUBGRADES ARE FULLY PROTECTED BY THE PERMANENT BUILDING STRUCTURE.
5. PLACE REINFORCING STEEL AND CONCRETE AS SOON AS POSSIBLE AFTER EXCAVATION FOR THE FOUNDATION SYSTEM.
6. NO MUD SLABS, FOUNDATIONS, OR STRUCTURAL SLABS SHALL BE PLACED INTO OR AGAINST SUBGRADES CONTAINING FREE WATER, FROST, OR ICE. SHOULD WATER OR FROST ENTER A FOUNDATION, MUD SLAB OR STRUCTURAL EXCAVATION AFTER SUBGRADE APPROVAL, THE SUBGRADE SHALL BE RE–INSPECTED AFTER REMOVAL OF WATER, FROST, OR ICE.
7. ALL SLAB AND FOUNDATION EXCAVATIONS AND/OR MUD SLABS SHALL BE THOROUGHLY CLEANED IMMEDIATELY PRIOR TO CONCRETE PLACEMENT.
8. ALL SLABS–ON–GRADE (EXCEPT PARKING) SHALL BE PLACED OVER A CONTINUOUS VAPOR RETARDER OVER A MINIMUM OF 6 INCHES OF COMPACTED GRANULAR MATERIAL WHICH IS PLACED OVER A COMPACTED SOIL SUBRADE, UNLESS NOTED OTHERWISE. ALL SLABS–ON–GRADE TO RECEIVE FINISHES.
9. ALL PERIMETER WALL AND COLUMN FOOTINGS SHALL BEAR A MINIMUM OF 3'–6" BELOW THE FINISHED GRADES INDICATED ON THE CIVIL DRAWINGS.
10. IF AT DESIGNED DEPTH SOIL BEARING CAPACITY DOES NOT MEET REQUIREMENT, OVEREXCAVATION AND BACKFILLING SHALL BE DONE UNDER SUPERVISION OF GEOTECHNICAL ENGINEER PER REQUIREMENT IN THE AFOREMENTIONED GEOTECHNICAL REPORT.

CONCRETE

1. CONCRETE STRENGTH SHALL MEET THE FOLLOWING 28–DAY COMPRESSIVE STRENGTHS (f'c), UON:

FOOTINGS AND PIERS	4,000 PSI
NON–SHRINK GROUT	4,000 PSI
SLAB ON GRADE	4,000 PSI

2. ALL CONCRETE PLACED OUTDOOR OR EXPOSED TO WEATHER SHALL BE AIR–ENTRAINED WITH 4–6% AIR CONTENT BY VOLUME.

3. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS SHOWING THE LOCATIONS OF ALL CONSTRUCTION JOINTS, CONTROL JOINTS, CURBS, SLAB DEPRESSIONS, SLEEVES, OPENINGS, ETC.
4. SEE ARCHITECTURAL, HVAC, ELECTRICAL AND PLUMBING DRAWINGS FOR ADDITIONAL SLAB OPENINGS. SLAB OPENINGS AND CORES SHALL BE SUBMITTED TO ARCHITECT FOR PRIOR, REVIEW AND WRITTEN APPROVAL.
5. ALL CONCRETE SHALL INCLUDE REINFORCEMENT. IF REINFORCEMENT IS NOT SPECIFICALLY INDICATED ON THE DRAWINGS VERIFY WITH THE STRUCTURAL ENGINEER.
6. ALL WELDED WIRE FABRIC (W.W.F.) SHALL CONFORM TO THE STANDARDS OF ASM A185. EPOXY COATED W.W.F. SHALL CONFORM TO THE STANDARDS OF ASTM A884, CLASS A.
7. PROVIDE CONSTRUCTION JOINTS IN ACCORDANCE WITH ACI–318. SUBMIT SHOP DRAWINGS SHOWING PROPOSED CONSTRUCTION JOINT LOCATIONS, DETAILS AND THE PLACEMENT SEQUENCE FOR THE STRUCTURAL ENGINEER'S APPROVAL PRIOR TO PROCEEDING WITH WORK.
8. PROVIDE SPECIFIED CURING COMPOUND AND SEALER FOR THE TOP SURFACE OF ALL SLAB WORK, UNLESS NOTED OTHERWISE ON ARCHITECTURAL DRAWINGS.

CONCRETE REINFORCEMENT

1. ALL CONCRETE SHALL INCLUDE REINFORCEMENT. IF REINFORCEMENT IS NOT SPECIFICALLY INDICATED ON THE DRAWINGS VERIFY WITH THE STRUCTURAL ENGINEER.
2. REINFORCEMENT SHALL CONFORM TO THE FOLLOWING STANDARDS AND MATERIAL PROPERTIES:

DEFORMED BARS:	ASTM A615, GRADE 60
WELDABLE DEFORMED BARS:	ASTM A706
EPOXY COATED DEFORMED BARS:	ASTM A615 / A775
WELDED WIRE REINFORCEMENT:	ASTM A185
EPOXY COATED WELDED WIRE REINFORCEMENT:	ASTM A185 / A884
ANCHOR ROD:	ASTM F1554 GR55

3. REINFORCEMENT SHALL HAVE CONCRETE PROTECTION (CLEAR COVER) PER ACI 318 UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
4. THE CONTRACTOR SHALL SUBMIT CHECKED SHOP DRAWINGS SHOWING REINFORCING DETAILS, INCLUDING STEEL SIZES, SPACING, PLACEMENT AND SUPPORT DETAILS AND DOWELS AT EXPANSIONS JOINTS FOR REVIEW PRIOR TO FABRICATION.

CONCRETE CONSTRUCTION JOINTS

1. PROVIDE CONSTRUCTION JOINTS IN ACCORDANCE WITH ACI–318. SUBMIT SHOP DRAWINGS SHOWING PROPOSED CONSTRUCTION JOINT LOCATIONS, DETAILS AND THE PLACEMENT SEQUENCE FOR THE STRUCTURAL ENGINEER'S APPROVAL PRIOR TO PROCEEDING WITH WORK.
2. NO HORIZONTAL CONSTRUCTION JOINTS WILL BE PERMITTED IN WALLS AND SLABS UNLESS SPECIFICALLY SHOWN ON THE DRAWINGS OR APPROVED IN WRITING BY THE DESIGN PROFESSIONALS PRIOR TO CONSTRUCTION.
3. PLACE VERTICAL CONSTRUCTION JOINTS TO PROVIDE A 60 FT MAXIMUM LENGTH OF CONCRETE PLACEMENT AND LOCATE AS FOLLOWS:
   A. FOUNDATION WALLS: MINIMUM OF 8 FT FROM ANY WALL INTERSECTION, PILASTER, PIER, OR WALL OPENING
   B. GRADE BEAMS SUPPORTING FOUNDATION WALLS: AT CENTERLINES BETWEEN SUPPORTS
4. PROVIDE CONTINUOUS WATERSTOPS AT ALL CONSTRUCTION JOINTS EXPOSED TO SOIL OR WATER, AS DESCRIBED IN THE SPECIFICATIONS. SUBMIT A SHOP DRAWING OR A CATALOG CUT TO THE ENGINEER AND THE OWNER FOR REVIEW AND APPROVAL.

STRUCTURAL STEEL:

STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE AISC SPECIFICATION FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS, AND THE AISC "CODE OF STANDARD PRACTICE". STRUCTURAL STEEL SHALL ALSO MEET REQUIREMENTS OF THE IBC 2021 BUILDING CODE AND CITY AMENDMENTS.

ALL BEAM CONNECTIONS SHALL BE PREPARED BY AN ILLINOIS REGISTRERED STRUCTURAL ENGINEER. CALCULATIONS FOR CONNECTIONS ARE TO BE SUBMITTED WITH SHOP DRAWINGS BEARING AN ILLINOIS S.E. STAMP AND SIGNITAURE.

STEEL SHALL CONFORM TO THE FOLLOWING ASTM SPECIFICATIONS (UNLESS OTHERWISE NOTED).

STRUCTURAL W–SHAPES:	A–992 (50 KSI)
STRUCTURAL M,S,HP,C,MC,L–SHAPES & PLs:	A–992 (36 KSI)
STRUCTURAL TUBING:	A–500 GRADE B (46 KSI)
STRUCTURAL PIPE:	A–53 (35 KSI)

UNLESS OTHERWISE NOTED ON DRAWINGS, TYPICAL CONNECTIONS FOR STEEL BEAMS SHALL BE STANDARD AISC FRAMED BEAM CONNECTIONS, UNLESS OTHERWISE SHOWN. ALL FIELD CONNECTIONS, EXCEPT WHERE SHOWN WELDED, SHALL BE BOLTED WITH 3/4" DIAMETER HIGH STRENGTH BOLTS CONFORMING TO ASTM A–325–N OR GREATER, UNLESS OTHERWISE NOTED. CONNECTIONS SHALL BE DESIGNED FOR 60% OF THE TOTAL ALLOWABLE UNIFORM LOAD DERIVED FROM THE AISC MANUALS TABLE OF "UNIFORM LOAD CONSTANTS" FOR NON–COMPSITE BEAMS.

ALL COPED BEAMS TO BE DESIGNED IN ACCORDANCE WITH APPENDIX 'B' OF THE AISC MANUAL "ENGINEERING FOR STEEL CONSTRUCTION" PROVIDE REINFORCING AS REQUIRED. ALL RE–ENTRANT CORNERS TO BE SHAPED, NOTCH–FREE, TO A RADIUS OF AT LEAST 1/2 INCH.

SINGLE PLATE FRAMING CONNECTIONS MAY BE USED IF DESIGNED ACCORDING TO APPENDIX B OF THE AISC MANUAL "DETAILING FOR STEEL CONSTRUCTION", LATEST EDITION. BEAM END REACTIONS SHALL BE DETERMINED AS SPECIFIED ABOVE.

ALL WELDING ELECTRODES SHALL BE E–70XX. ALL SHOP AND FIELD WELDING SHALL BE MADE IN ACCORDANCE WITH A.W.S. D1.1, LATEST EDITION "CODE FOR WELDING IN BUILDING CONSTRUCTION", AND SHALL BE MADE BY QUALIFIED "CERTIFIED" WELDERS.

PROVIDE GOVERNMENT ANCHORS FOR BEAM BEARING ON MASONRY WHERE ANCHOR BOLTS OR OTHER ANCHORAGE IS NOT SPECIFIED.

ALL STRUCTURAL STEEL EXPOSED TO THE ELEMENTS SHALL BE GALVANIZED AS SPECIFIED IN THE ARCHITECTURAL SPECIFICATIONS. ALL EXTERIOR STEEL (INCLUDING CONNECTIONS) SHALL CONFORM TO THE IBC 2021 BUILDING CODE AND CITY AMENDMENTS.

PROVIDE HARDENED WASHERS OVER ALL OVERSIZED AND SHORT SLOTTED HOLES IN AN OUTER PLY. PROVIDE 5/16" MINIMUM THICKNESS PLATE WASHERS WITH STANDARD HOLES OVER ALL LONG SLOTTED HOLES IN AN OUTER PLY – SUCH PLATE WASHERS TO COMPLETELY COVER THE SLOT AFTER INSTALLATION.

PROVIDE MINIMUM WELD SIZE PER AISC 1.17.2.
SHOP DRAWINGS AND OTHER SUBMITTALS:

A. CONTRACTOR SHALL PROVIDE COMPLETE, CHECKED AND STAMPED SHOP DRAWINGS/SUBMITTALS/OR CALCULATIONS, AS APPLICABLE FOR THE FOLLOWING ITEMS:

1. COMPLETE STRUCTURAL DESIGN DRAWINGS AND STRUCTURAL CALCULATION FOR THE CANOPY SUPERSTRUCTURE AND SUBSTRUCTURE, SIGNED AND SEALED BY ILLINOIS LICENSED STRUCTURAL ENGINEER.
2. CONCRETE MIX DESIGNS
3. STRUCTURAL STEEL SHOP DRAWINGS
4. CONCRETE REINFORCING STEEL SHOP DRAWINGS
5. ANCHOR ROD SHOP DRAWINGS
6. WATER STOPS SHOP DRAWINGS

BID SET

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DESIGNED	CCJM
DRAWN	CCJM
CHECKED	CCJM

SEAL AFFIXED 12-08-2023 EXP. 11-30-2024

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE

CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

STRUCTURAL

GENERAL STRUCTURAL NOTES

PROJECT NO.: 00280
DWG: **S01**
SHEET: 7 OF 20
DATE: DEC 2023 REV: -

SPECIAL INSPECTIONS:

THIS SECTION APPLIES TO THE STRUCTURAL PORTIONS OF THE PROJECT REQUIRING SPECIAL INSPECTION.

DUTIES AND RESPONSIBILITIES OF THE SPECIAL INSPECTOR:
a) THE SPECIAL INSPECTOR SHALL BE A QUALIFIED PERSON WHO SHALL DEMONSTRATE COMPETENCE, TO THE SATISFACTION OF THE BUILDING OFFICIAL AND THE ENGINEER OF RECORD FOR INSPECTION OF THE PARTICULAR TYPE OF CONSTRUCTION OR OPERATIONS REQUIRING SPECIAL INSPECTIONS.
b) THE SPECIAL INSPECTOR SHALL OBSERVE THE WORK ASSIGNED FOR CONFORMANCE WITH THE APPROVED DESIGN DRAWINGS AND SPECIFICATIONS.
c) COPIES OF TEST RESULTS AND FINAL REPORTS SHALL BE FURNISHED TO THIS ENGINEER IN ADDITION TO OTHER NORMAL DISTRIBUTIONS WITHIN ONE WEEK OF THE TEST OR INSPECTION.
d) ALL DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. THEN IF UNCORRECTED TO THE ENGINEER OF RECORD AND TO THE BUILDING OFFICIAL.
e) THE SPECIAL INSPECTOR SHALL SUBMIT A FINAL SIGNED REPORT STATING WHETHER THE WORK REQUIRING SPECIAL INSPECTION WAS TO THE BEST OF THE INSPECTOR'S KNOWLEDGE, IN CONFORMANCE WITH THE APPROVED PLANS AND SPECIFICATIONS AND THE APPLICABLE WORKMANSHIP PROVISIONS.

ALL TEST AND INSPECTIONS SHALL BE PERFORMED BY AN INDEPENDENT TESTING AND INSPECTION AGENCY EMPLOYED BY THE OWNER (OR CONTRACTOR IF DIRECTED BY OWNER). JOB SITE VISITS BY THE ENGINEER OF RECORD DO NOT CONSTITUTE A SPECIAL INSPECTION.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING THE TEST AND INSPECTION FIRM WITH A SCHEDULE TO FACILITATE THE PROPER COORDINATION OF WORK.

IBC SECTION 17.5.2
REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCE STANDARD	REQUIRED THIS PROJECT
1. MATERIAL VERIFICATION OF HIGH-STRENGTH BOLTS, NUTS AND WASHERS:				
a. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	–	X	AISC 360 SECTION A3.3, APPLICABLE ASTM MATERIAL STANDARDS	YES
b. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED	–	X	–	YES
2. INSPECTION OF HIGH-STRENGTH BOLTING:				
a. SNUG TIGHT JOINTS.	–	X	AISC 360, SECTION M2.5	YES
b. PRETENSIONED AND SLIP-CRITICAL JOINTS USING TURN-OF-NUT WITH MATCHMARKING, TWIST-OFF BOLT OR DIRECT TENSION INDICATOR METHODS OF INSTALLATION.	–	X		
c. PRETENSIONED AND SLIP-CRITICAL JOINTS USING TURN-OF-NUT WITHOUT MATCHMARKING OR CALIBRATED WRENCH METHODS OF INSTALLATION.	X	–		
3. MATERIAL VERIFICATION OF STRUCTURAL STEEL AND COLD-FORMED STEEL DECK:				
a. IDENTIFICATION MARKING TO CONFORM TO ASTM STANDARD SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	–	X	ASTM A6 OR ASTM A568	YES
b. MANUFACTURER'S CERTIFIED MILL TEST REPORTS.	–	–		
4. MATERIAL VERIFICATION OF WELD OR FILLER MATERIALS:				
a. IDENTIFICATION MARKING TO CONFORM TO AWS SPECIFICATION IN THE APPROVED CONSTRUCTION DOCUMENTS.	–	–	ASTM A6 OR ASTM A568	YES
b. MANUFACTURER'S CERTIFIED MILL TEST REPORTS.	–	–		
5. INSPECTION OF WELD:				
a. STRUCTURAL STEEL:				
1) COMPLETE AND PARTIAL PENETRATION GROOVE WELDS.	X	–	AWS D1.1	YES
2) MULTIPASS FILLET WELDS.	X	–	AWS D1.1	YES
3) SINGLE PASS FILLET WELDS > 5/16"	X	–	AWS D1.1	YES
4) SINGLE PASS FILLET WELDS ≤ 5/16"	–	X	AWS D1.1	YES
5) FLOOR AND ROOF DECK WELDS.	–	X	AWS D1.3	YES
b. REINFORCING STEEL:				
1) VERIFICATION OF WELDABILITY OF REINFORCING STEEL OTHER THAN ASTM A706.	–	X	AWS D1.4 ACI 318:3.5.2	YES
2) REINFORCING STEEL RESISTING FLEXURAL AND AXIAL FORCES IN INTERMEDIATE AND SPECIAL MOMENT FRAMES AND BOUNDARY ELEMENTS OF SPECIAL REINFORCED CONCRETE SHEAR WALLS AND SHEAR REINFORCEMENT.	X	–	AWS D1.4 ACI 318:3.5.2	YES
3) SHEAR REINFORCEMENT.	X	–	AWS D1.4 ACI 318:3.5.2	YES
3) OTHER REINFORCEMENT.	–	X	AWS D1.4 ACI 318:3.5.2	YES
5. INSPECTION OF STEEL FRAME JOINT DETAILS FOR COMPLIANCE WITH APPROVED CONSTRUCTION DOCUMENTS:				
a. DETAILS SUCH AS BRACING AND STIFFENING.	–	X		YES
b. MEMBER LOCATIONS.	–	X		YES
c. APPLICATION OF JOINT DETAILS AT EACH CONNECTION.	–	X		YES

TABLE 1705.3
REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION
(NOT APPLICABLE TO ISOLATED SPREAD FOOTINGS AND NON-STRUCTURAL SLABS ON GROUND)

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCE STANDARD	IBC REFERENCE	REQUIRED THIS PROJECT
1. INSPECTION OF REINFORCING STEEL, INCLUDING PRESTRESSING TENDONS, AND PLACEMENT.	–	X	ACI 318: 3.5, 7.1–7.7	1910.4	YES
2. INSPECTION OF REINFORCING STEEL WELDING IN ACCORDANCE WITH TABLE 1705.2.2, ITEM 2b.	–	–	AWS D1.4 ACI 318: 3.5.2	–	YES
3. INSPECTION OF ANCHORS CAST IN CONCRETE WHERE ALLOWABLE LOADS HAVE BEEN INCREASED OR WHERE STRENGTH DESIGN IS USED.	–	X	ACI 318: 8.1.3, 21.1.8	1908.5, 1909.1	YES
4. INSPECTION OF ANCHORS POST-INSTALLED IN HARDENED CONCRETE MEMBERS.	–	X	ACI 318: 3.8.6, 8.1.3, 21.1.8	1909.1	YES
5. VERIFYING USE OF REQUIRED DESIGN MIX.	–	X	ACI 318: Ch. 4, 5.2–5.4	1904.2, 1910.2, 191.3	YES
6. AT THE TIME FRESH CONCRETE IS SAMPLED TO FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE.	X	–	ASTM C 172 ASTM C 31 ACI 318: 5.6, 5.8	1910.10	YES
7. INSPECTION OF CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES.	X	–	ACI 318: 5.9, 5.10	1909.6, 1910.7, 1910.8	YES
8. INSPECTION OF FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.	–	X	ACI 318: 5.11–5.13	1910.9	YES
9. INSPECT OF PRESTESSED CONCRETE:					
a. APPLICATION OF PRESTRESSING FORCES.	X	–	ACI 318: 18.20	–	N/A
b. GROUTING OF BONDED PRESTRESSING TENDONS IN THE SEISMIC FORCE-RESTING SYSTEM	X	–	ACI 318:18.18.4		
10. ERECTION OF PRECAST CONCRETE MEMBERS	–	X	ACI 318: Ch.16	–	N/A
11. VERIFICATION OF IN-SITU CONCRETE STRENGTH, PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.	–	X	ACI 318: 6.2	–	N/A
12. INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.	–	X	ACI 318: 6.1.1	–	YES

TABLE 1705.6
REQUIRED VERIFICATION AND INSPECTION OF SOILS

VERIFICATION AND INSPECTION TASK	CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED	REQUIRED THIS PROJECT
1. VERIFY MATERIAL BELOW SHALLOW FOUNDATIONS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.	–	X	YES
2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL.	–	X	YES
3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS.	–	X	YES
4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.	X	–	YES
5. PRIOR TO PLACEMENT OF COMPACTED FILL, OBSERVE SUBGRADE AND VERITY THAT SITE HAS BEEN PREPARED PROPERLY.	–	X	YES

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STATE OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2024

DESIGNED	CCJM
DRAWN	CCJM
CHECKED	CCJM

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE

CITY OF EVANSTON, ILLINOIS

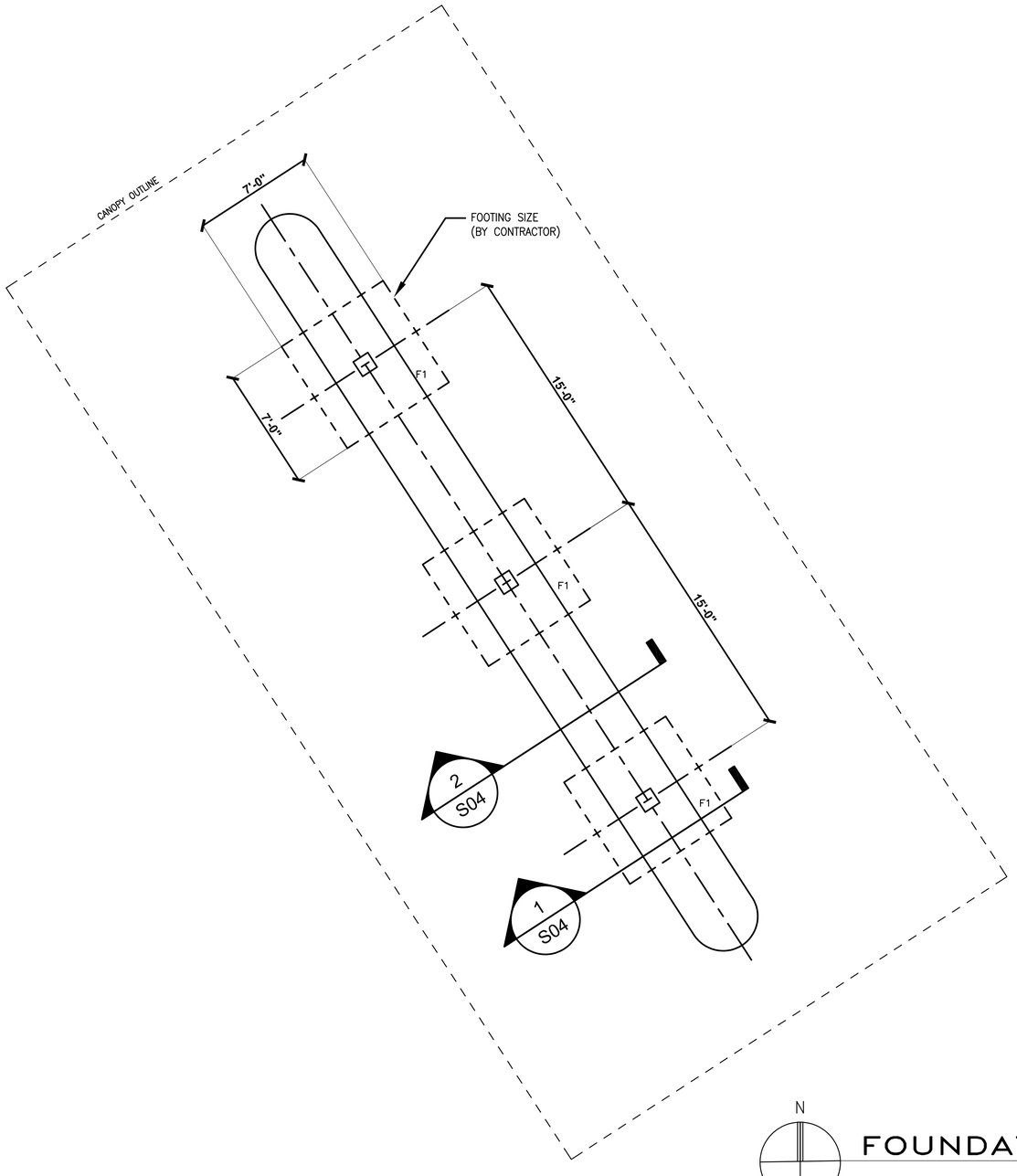
SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

STRUCTURAL

GENERAL STRUCTURAL NOTES & SCHEDULES

PROJECT NO.: 00280
DWG: **S02**
SHEET: 8 OF 20
DATE: DEC 2023 REV: -

BID SET



GENERAL NOTES:

1. ALL CONCRETE TO BE AIR–ENTRAINED CONCRETE W/4–6% AIR CONTENT BY VOLUME.
2. THE FOOTING SIZE AND PROPERTIES INCLUDING TYPE OF CONCRETE, LENGTH, WIDTH, DEPTH, AND REINFORCEMENT DESIGN IS BY CONTRACTOR.
3. THE SPACING BETWEEN POSTS IS TO BE CONFIRMED BY CONTRACTOR BASED ON CANOPY LOADS

N

FOUNDATION PLAN

SCALE: 1/4" = 1'–0"

BID SET

CCJM Engineers, Ltd.
Engineering Infrastructure Solutions
303 East Wacker Drive, Suite 303
Chicago, Illinois 60601-3007
312.669.0609 • 312.669.0525 Fax
e-mail: chicago@ccjm.com

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED CCJM
DRAWN CCJM
CHECKED CCJM

LICENSED STRUCTURAL ENGINEER
PRASADU BABU PENJENDRA
81–007591
STATE OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2024

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE

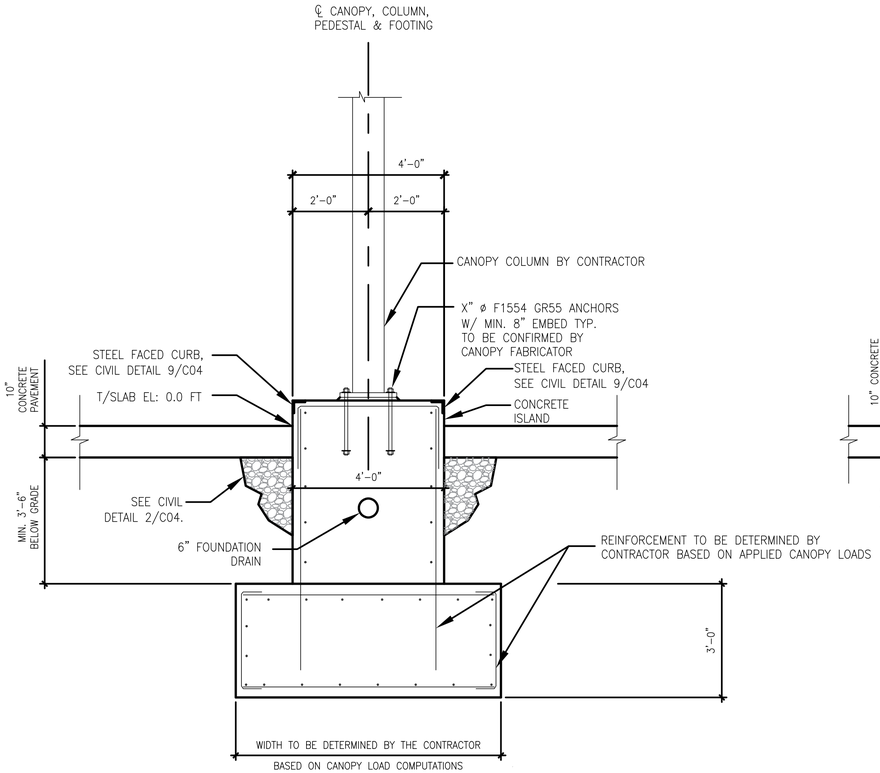
CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

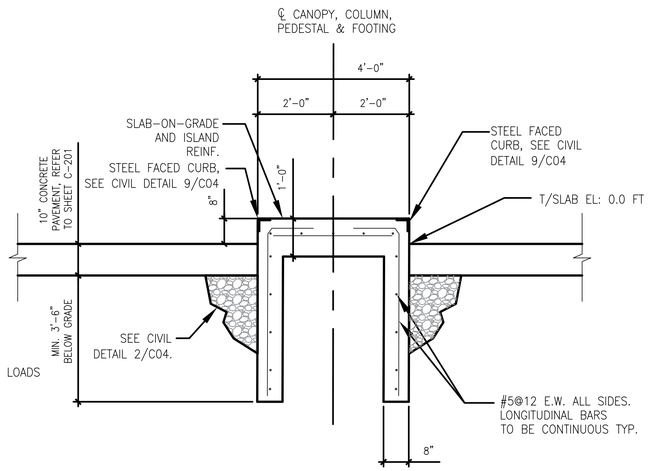
STRUCTURAL

STRUCTURAL FOUNDATION PLAN

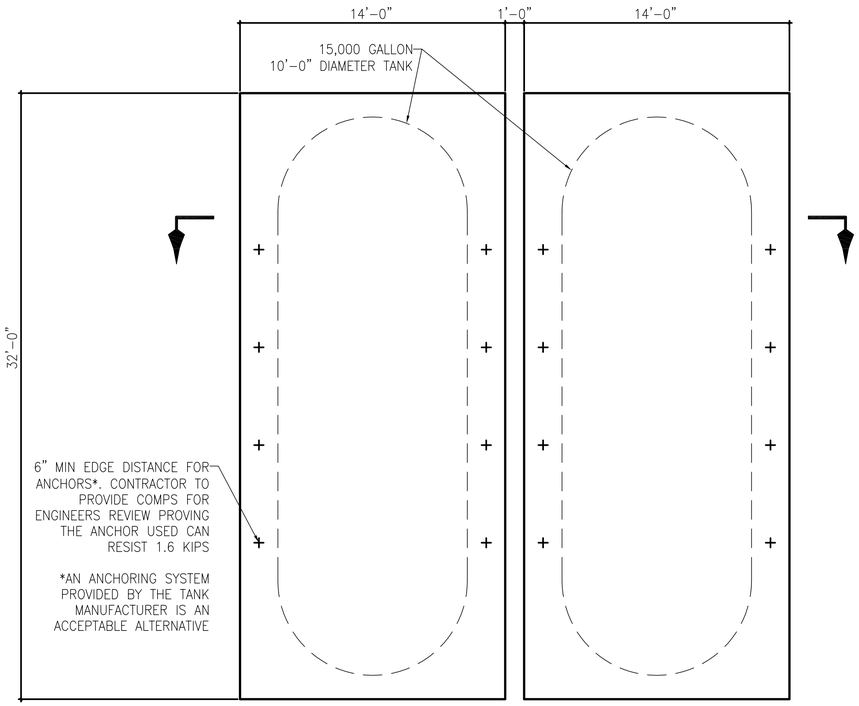
PROJECT NO.: 00280
DWG: **S03**
SHEET: 9 OF 20
DATE: DEC 2023 REV: -



1 TYPICAL COLUMN FOOTING DETAIL
1/2"=1'

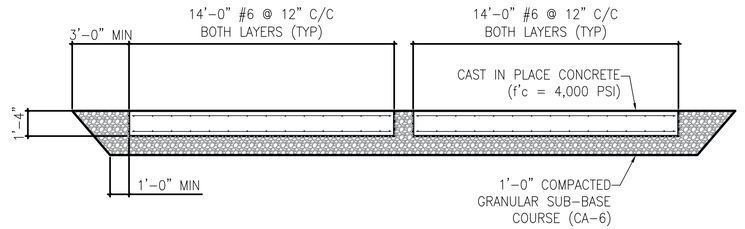


2 TYPICAL EQUIPMENT PAD DETAIL
1/2"=1'



FUEL STORAGE SLAB FOUNDATION PLAN
SCALE: 1/4" = 1'-0"

ALL CONCRETE TO BE AIR-ENTRAINED W/4-6% AIR CONTENT BY VOLUME. ALL REINFORCEMENT TO BE EPOXY COATED.



REBAR & SUBGRADE - SECTION
SCALE: 1/4" = 1'-0"

CCJM Engineers, Ltd.
Engineering Infrastructure Solutions
303 East Wacker Drive, Suite 303
Chicago, Illinois 60601-3007
312.669.0609 • 312.669.0525 Fax
e-mail: chicago@ccjm.com

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED	CCJM
DRAWN	CCJM
CHECKED	CCJM

LICENSED STRUCTURAL ENGINEER
PRASADU BABU PENJENDRA
81-007591
STATE OF ILLINOIS
SEAL AFFIXED 12-08-2023
EXP. 11-30-2024

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE

CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

STRUCTURAL

STRUCTURAL FOUNDATION DETAILS

PROJECT NO.: 00280
DWG: **S04**
SHEET: 10 OF 20
DATE: DEC 2023 | REV: -

BID SET

VALVE SYMBOLS

DESCRIPTION	SCHEMATIC	THREE LINE	SINGLE LINE
GATE			
BUTTERFLY			
PLUG			
CHECK (SWING)			
CONE			
BALL			
DIAPHRAGM			
GLOBE			
ANGLE			
THREE WAY			
FOUR WAY			
FLAP			
PRESSURE RELIEF			
AUTO AIR AND VACUUM RELEASE	AVR	AVR	AVR
AUTO AIR RELEASE	AR	AR	AR
AUTO VACUUM RELEASE	VR	VR	VR
PRESSURE REDUCING			
HOSE			
STOP AND DRAIN			

PIPE FITTINGS

DESCRIPTION	SCHEMATIC	THREE LINE	SINGLE LINE
CROSS	NA		
CROSS	NA		
TEE	NA		
TEE	NA		
TEE	NA		
SIDE OUTLET TEE	NA		
SIDE OUTLET TEE	NA		
LATERAL	NA		
90° ELBOW	NA		
90° ELBOW	NA		
90° ELBOW	NA		
90° ELBOW (LONG RADIUS)	NA	LR	LR
45° ELBOW	NA		
45° ELBOW	NA		
45° ELBOW	NA		
45° ELBOW (LONG RADIUS)	NA	LR	LR
SIDE OUTLET ELBOW	NA		
SIDE OUTLET ELBOW	NA		
BASE ELBOW	NA		

PIPE FITTINGS

DESCRIPTION	SCHEMATIC	THREE LINE	SINGLE LINE
UNION (SCREWED)			
REDUCER			
REDUCER - ECCENTRIC (OFFSET VIEW)	NA		
BLIND FLANGE			
SLEEVE TYPE COUPLING			
SLEEVE TYPE COUPLING (HARNESSED)	H	H	H
GROOVED TYPE COUPLING	GC	GC	GC
EXPANSION JOINT RUBBER BELLOWS TYPE			
EXPANSION JOINT METAL BELLOWS TYPE			
VENTURI METER			
METER	M	M	M
STRAINER			
DUPLEX STRAINER			
LUBE OIL FILTER		NA	
MOISTURE SEPARATOR		NA	
SCALE TRAP		NA	
FLAME TRAP			
VENT			
THERMOSTAT (TEMPERATURE REGULATOR)	T	T	T
PRESSURE GAUGE			
THERMOMETER			
WATER LEVEL ALARM	HWL OR LWL	HWL OR LWL	HWL OR LWL
DIFFERENTIAL PRESSURE GAUGE			

PIPE JOINTS

DESCRIPTION	SCHEMATIC	THREE LINE	SINGLE LINE
FLANGE	NA		
MECHANICAL JOINT	NA		
MECHANICAL JOINT (RESTRAINED)	NA	R	R
PUSH ON OR BELL AND SPIGOT	NA		
PUSH ON OR BELL AND SPIGOT (RESTRAINED)	NA	R	R
WELDED	NA		NA
SCREWED	NA		
JOINT IN CONCRETE PIPE	NA		NA

WALL FITTINGS

DESCRIPTION	SCHEMATIC	THREE LINE	SINGLE LINE
WALL SLEEVE (CAULKED)	NA		
WALL SLEEVE (ANNULAR TYPE SEAL)	NA		
WALL SLEEVE (MECHANICAL JOINT)	NA		
FLANGE AND FLANGE WALL PIPE WITH INTERMEDIATE COLLAR (F x F x F)	NA		
BELL AND BELL WALL PIPE WITH INTERMEDIATE COLLAR (B x F x B)	NA		
MECHANICAL JOINT AND MECHANICAL JOINT WALL PIPE WITH INTERMEDIATE COLLAR (MJ x F x MJ)	NA		
BELL AND FLANGE WALL PIPE WITH INTERMEDIATE COLLAR (B x F x F)	NA		
MECHANICAL JOINT AND FLANGE WALL PIPE WITH INTERMEDIATE COLLAR (MJ x F x F)	NA		
STEEL WALL RING FOR MECHANICAL JOINT AND CONCRETE PIPE (RUBBER AND STEEL)	NA		NA

VALVE OPERATORS

X — PLACE KEY FOR OPERATOR IN PLACE OF X

NONE MANUAL
C CHAINWHEEL
D DIAPHRAGM
F FLOAT
G GEAR
H HYDRAULIC CYLINDER

M MOTOR (ELECTRIC)
P PNEUMATIC CYLINDER
S SOLENOID
A AIR MOTOR
N NUT

FUEL PIPING LEGEND:

FUEL OIL SUPPLY	FOS
FUEL OIL RETURN	FOR
FUEL OIL FILL	FOF
FUEL OIL VENT	FOV

NOTES:

1. THIS IS A GENERAL LEGEND PROVIDED TO FACILITATE USE OF THE DRAWINGS. REFER TO THE DRAWINGS AND SPECIFICATIONS FOR ITEMS REQUIRED.
2. VALVES AND PIPE FITTINGS ARE SHOWN WITH FLANGED JOINTS. ITEMS ARE AVAILABLE WITH VARIOUS JOINTS AND ARE SHOWN AS REQUIRED.
3. NA MEANS NOT APPLICABLE.

BID SET

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED	BW
DRAWN	GS
CHECKED	MD

MICHAEL A. DEBNAR 062.066817 LICENSED PROFESSIONAL ENGINEER OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

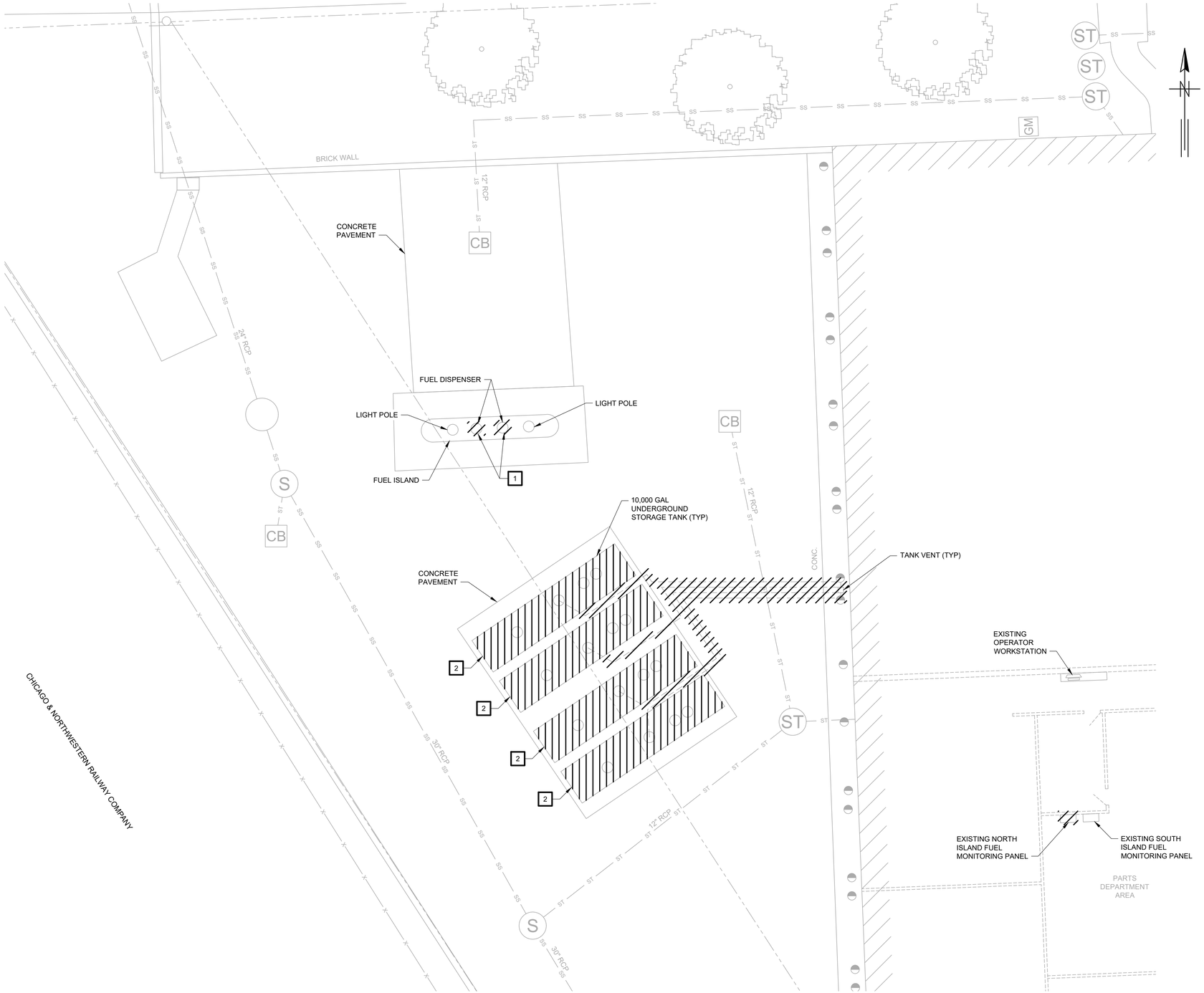
NO.	DATE	APPD	REVISION DESCRIPTION

SCALE: NO SCALE

CITY OF EVANSTON, ILLINOIS
SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

MECHANICAL
SYMBOL LEGEND

PROJECT NO.: 00280
DWG: M01
SHEET: 11 OF 20
DATE: DEC 2023 REV: 0



DEMOLITION KEY NOTES

1. REMOVE AND SAVE EXISTING FUEL DISPENSERS AND STORE THEM AT LOCATION DESIGNATED BY THE OWNER. DEMOLISH ALL ASSOCIATED UNDERGROUND AND ABOVEGROUND PIPING.
2. DEMOLISH AND REMOVE EXISTING UNDERGROUND FUEL STORAGE TANKS AND ALL ASSOCIATED UNDERGROUND AND ABOVEGROUND PIPING.

MECHANICAL PLAN - DEMOLITION

SCALE: 1" = 10'

NOTES:

1. CONTRACTOR TO VERIFY VERTICAL AND HORIZONTAL LOCATIONS OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.

BID SET

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED BW
DRAWN GS
CHECKED MD

MICHAEL A. DEBNAR 062.066817 LICENSED PROFESSIONAL ENGINEER OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE
10 0 10 20 FT
1"=10'

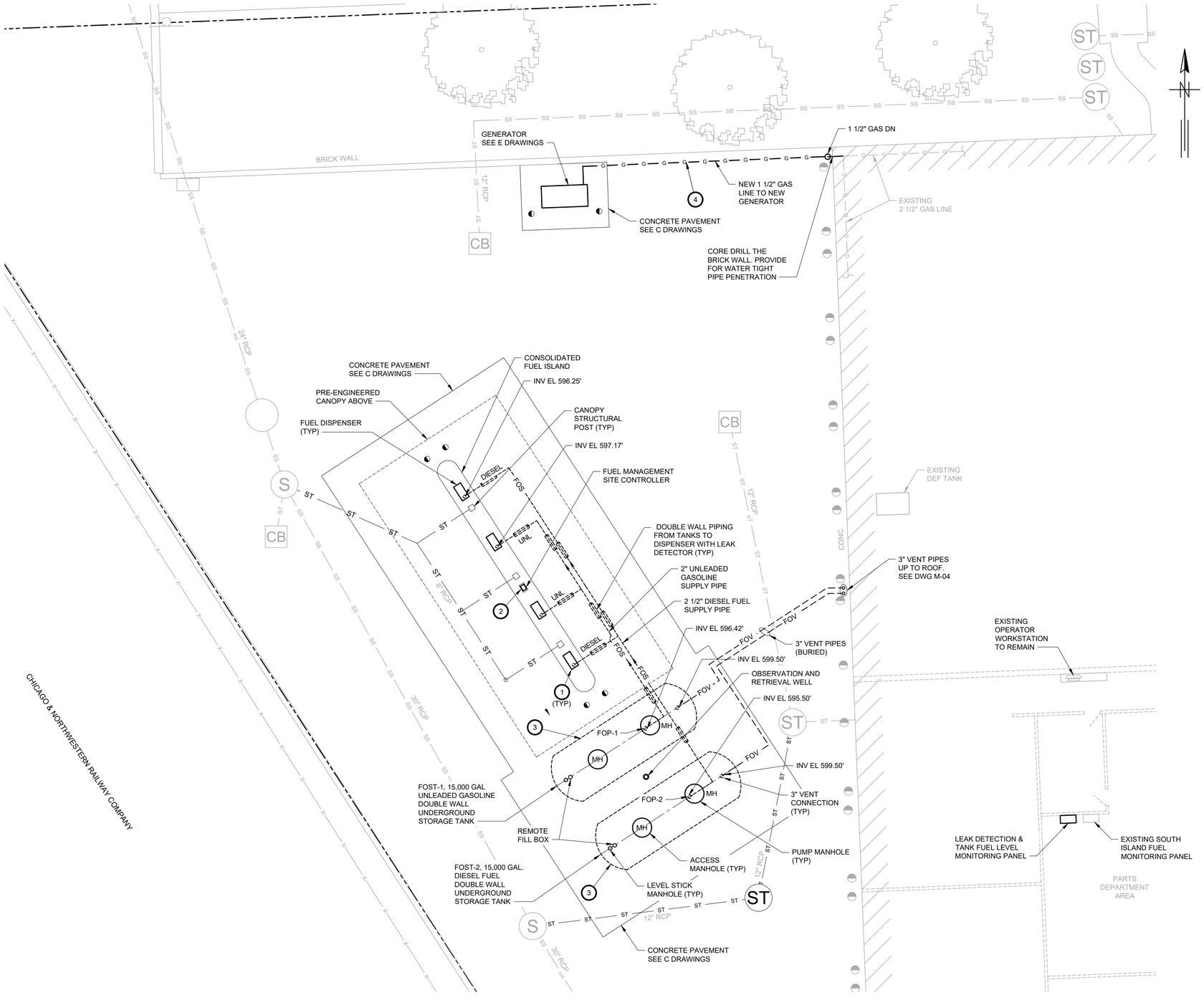
CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

MECHANICAL

MECHANICAL PLAN - DEMOLITION

PROJECT NO.: 00280
DWG: M02
SHEET: 12 OF 20
DATE: DEC 2023 REV: 0



NEW CONSTRUCTION KEY NOTES

1. INSTALL NEW FUEL DISPENSER (TYP OF 4)
2. INSTALL FUEL MANAGEMENT SITE CONTROLLER.
3. INSTALL FUEL OIL UNDERGROUND TANKS.
4. INSTALL NEW GAS LINE FOR NEW GENERATOR ALONG RETAINING BRICK WALL WITH SUPPORT AS REQUIRED 4 FEET ABOVE GRADE. COORDINATE WITH ELECTRICAL FOR CONNECTION AT GENERATOR.

NOTES:

1. CONTRACTOR TO VERIFY VERTICAL AND HORIZONTAL LOCATIONS OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
2. ROUTE ALL PIPING IN FIELD AS APPROVED BY THE AUTHORITY.
3. DEPTH OF BURY AS SHOWN AND APPROVED BY THE AUTHORITY.
4. SLOPE ALL PIPING TOWARD UNDERGROUND STORAGE TANKS.
5. PROVIDE DOUBLE ELBOW SWING JOINTS AT EACH CHANGE OF DIRECTION FOR ALL FUEL OIL PIPING.

MECHANICAL PLAN - NEW WORK

SCALE: 1" = 10'

BID SET

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED	BW
DRAWN	GS
CHECKED	MD

MICHAEL A. DEENEY 062.066817 LICENSED PROFESSIONAL ENGINEER STATE OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE: 10 0 10 20 FT — 1"=10'

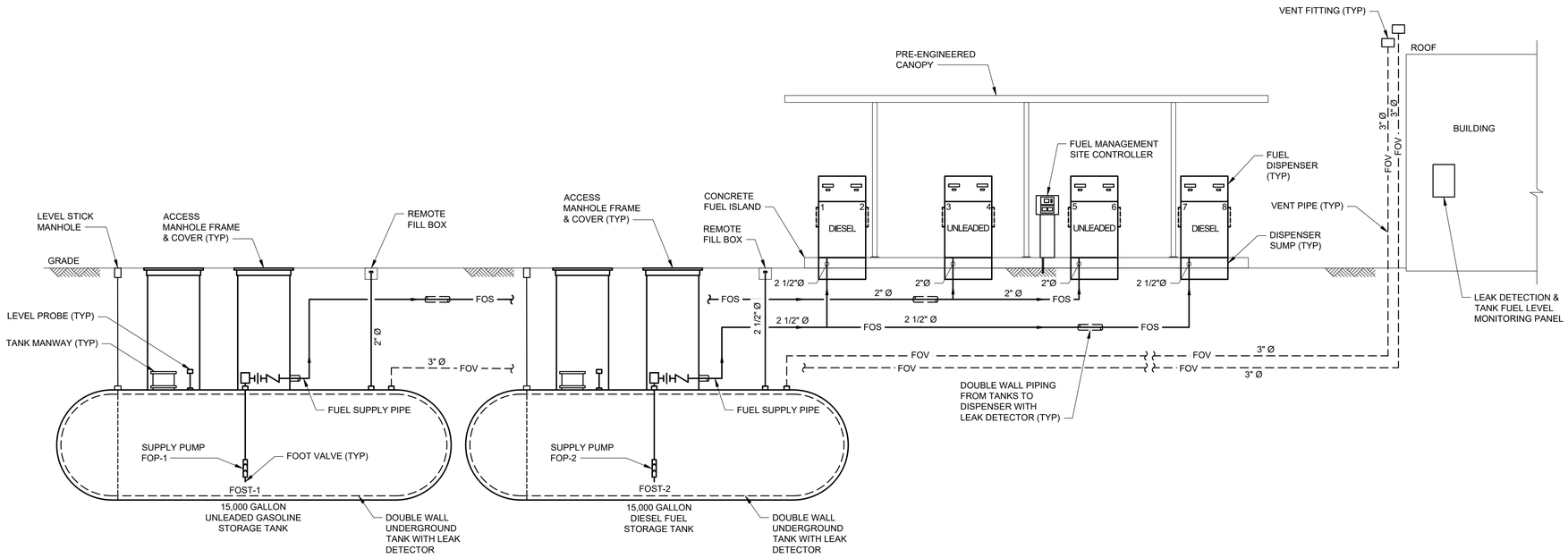
CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

MECHANICAL

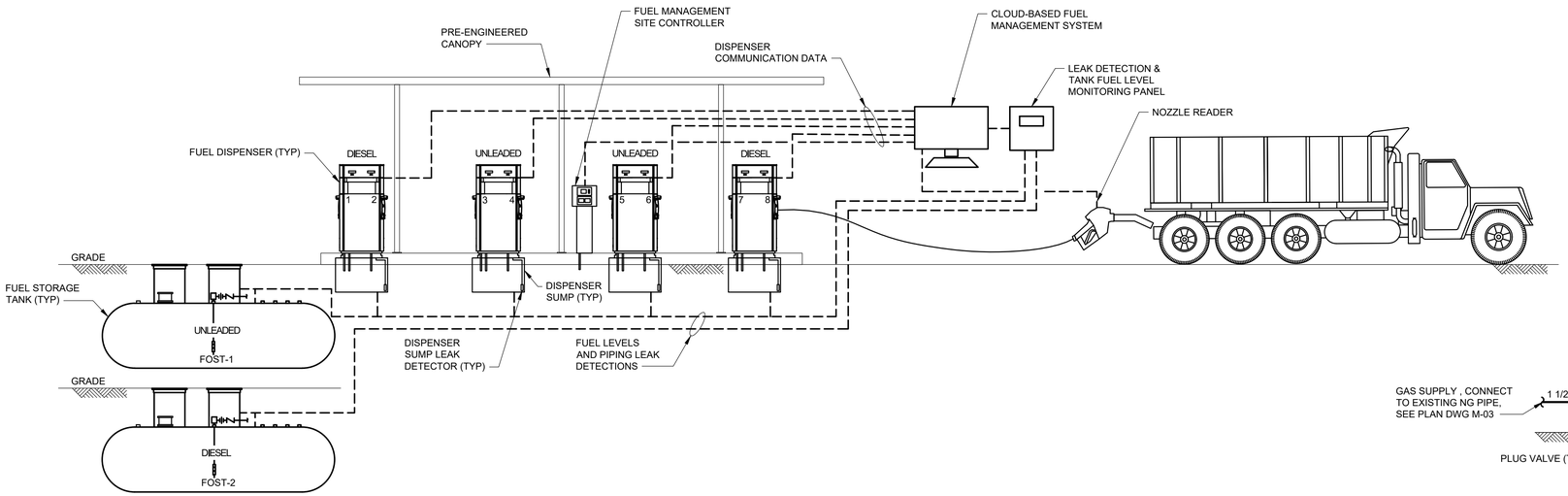
MECHANICAL PLAN - NEW WORK

PROJECT NO.: 00280
DWG: M03
SHEET: 13 OF 20
DATE: DEC 2023 REV: 0



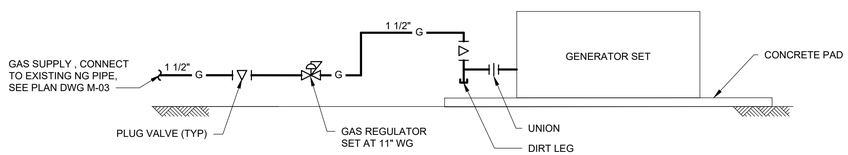
FUEL PIPING DIAGRAM

SCALE: NONE



FUEL MANAGEMENT SYSTEM DIAGRAM

SCALE: NONE



NATURAL GAS PIPING DIAGRAM

SCALE: NONE

BID SET

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED	BW
DRAWN	GS
CHECKED	MD

MICHAEL A. DEGNAN 062.066817 LICENSED PROFESSIONAL ENGINEER OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE: NO SCALE

CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

MECHANICAL

DIAGRAMS

PROJECT NO.: 00280
DWG: M04
SHEET: 14 OF 20
DATE: DEC 2023 REV: 0

TANK

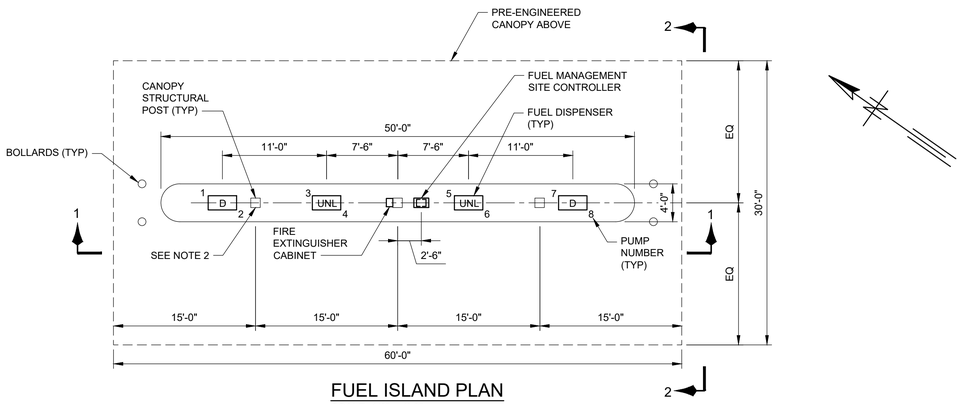
UNIT I.D.	LOCATION	SERVICE	CAPACITY (GAL.)	DIA. (FT)	LENGTH (FT)	MAX WORKING PRESSURE (PSIG)	MANUFACTURER MODEL NO.	REMARKS/NOTES
FOST-1	SERVICE CENTER NORTH FUEL ISLAND	UNLEADED	15,000	10'	30'	--	ZCL/XERXES	1,2,3
FOST-2	SERVICE CENTER NORTH FUEL ISLAND	DIESEL	15,000	10'	30'	--	ZCL/XERXES	1,2,3

NOTES: 1. FIBERGLASS 2. DOUBLE-WALL 3. UL 1316 UNDERGROUND STORAGE TANK

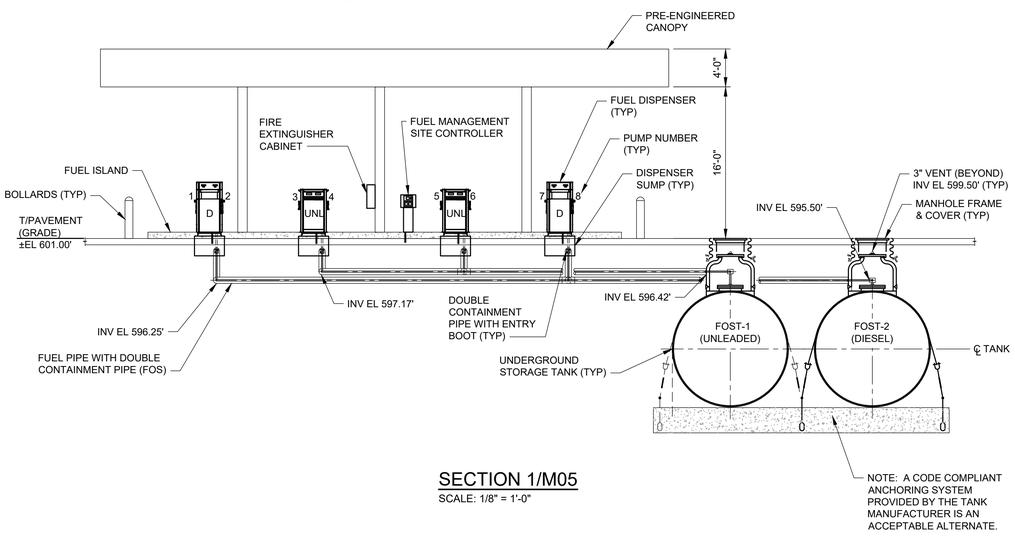
PUMPS

UNIT I.D.	LOCATION	SERVICE	TYPE	FUEL OIL		MOTOR				MANUFACTURER MODEL NO.	REMARKS/NOTES
				GPM	HEAD ('H2O)	BHP	HP	RPM	V/PH/HZ		
FOP-1	SERVICE CENTER NORTH FUEL ISLAND	FOST-1 (UNLEADED)	CENTRIFUGAL	40	60	--	2	--	208/3/60	MAXXUM STP	1,2
FOP-2	SERVICE CENTER NORTH FUEL ISLAND	FOST-2 (DIESEL)	CENTRIFUGAL	40	80	--	2	--	208/3/60	MAXXUM STP	1,2

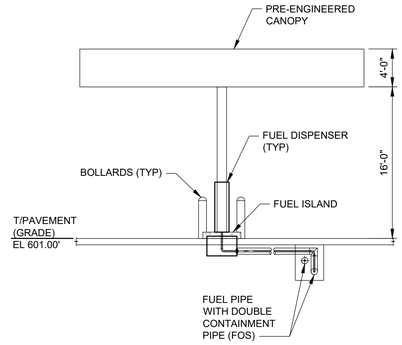
NOTES: 1. EXPLOSION PROOF 2. SUBMERSIBLE



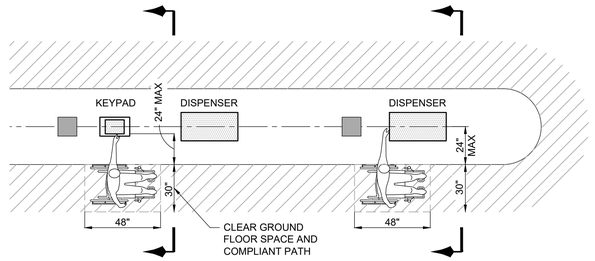
FUEL ISLAND PLAN
SCALE: 1/8" = 1'-0"



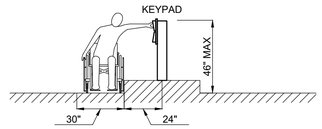
SECTION 1/M05
SCALE: 1/8" = 1'-0"



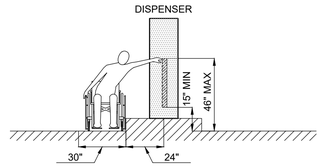
SECTION 2/M05
SCALE: 1/8" = 1'-0"



ADA PLAN REQUIREMENT
SCALE: 1/4" = 1'-0"



ADA KEYPAD SECTION
SCALE: 1/4" = 1'-0"



ADA DISPENSER SECTION
SCALE: 1/4" = 1'-0"

NOTES:

1. LOCATE EQUIPMENT ALONG THE CENTERLINE OF THE ISLAND.
2. RUN CANOPY DOWNSPOUTS INSIDE EACH COLUMN. CONNECT TO STORM DRAIN LINES BELOW GRADE.
3. FUEL DISPENSERS, KEYPADS, AND ALL OTHER EQUIPMENT TO BE IN CONFORMANCE WITH THE ILLINOIS ACCESSIBILITY CODE. PROVIDE ALL OPERABLE PARTS TO BE WITHIN A 24-INCH MAXIMUM REACH FROM THE EDGE OF THE CURB AND AT A HEIGHT RANGE OF 15-INCHES TO 46-INCHES FROM THE FINISHED GRADE. REFER TO ADA REQUIREMENT PLAN AND SECTIONS ON THIS SHEET.

BID SET

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED BW
DRAWN GS
CHECKED MD

MICHAEL A. DEMAS 062.066817 LICENSED PROFESSIONAL ENGINEER OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

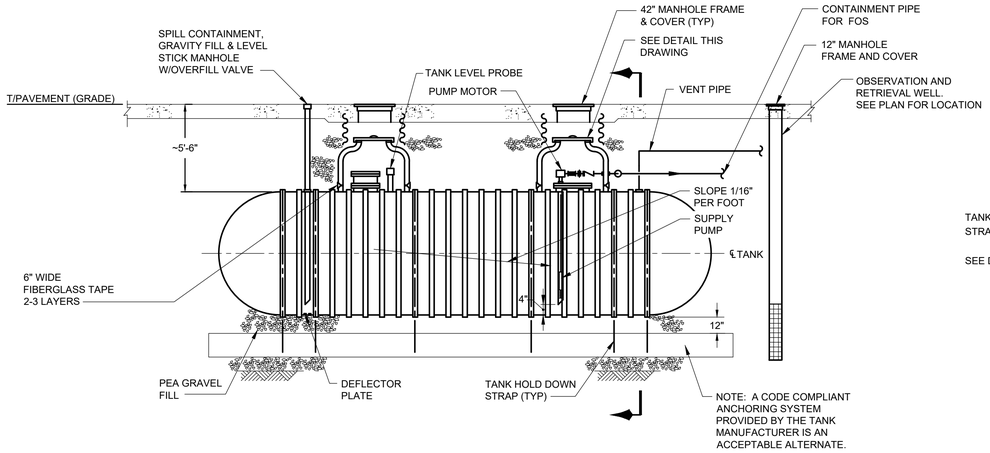
NO.	DATE	APPD	REVISION DESCRIPTION

SCALE
8 0 8 16 FT 1/8"=1'-0"
4 0 4 8 FT 1/4"=1'-0"

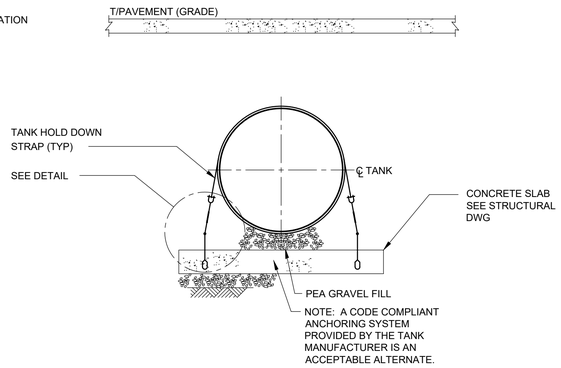
CITY OF EVANSTON, ILLINOIS
SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

MECHANICAL
SCHEDULES AND SECTIONS

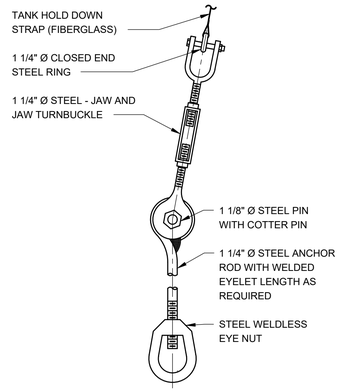
PROJECT NO.: 00280
DWG: M05
SHEET: 15 OF 20
DATE: DEC 2023 REV: 0



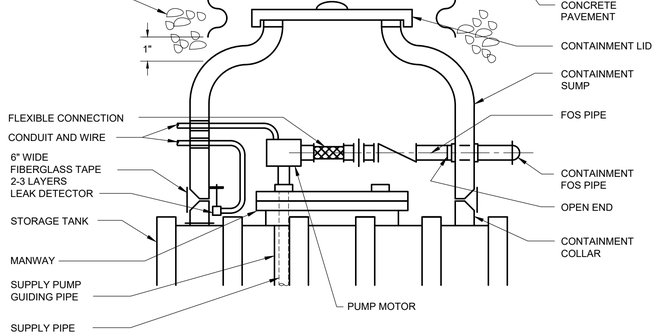
FUEL STORAGE TANK DETAIL
NOT TO SCALE



FUEL STORAGE TANK - SECTION
NOT TO SCALE



FUEL STORAGE TANK ANCHOR DETAIL
NOT TO SCALE



MANWAY AND CONTAINMENT SUMP DETAIL
NOT TO SCALE

BID SET

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED	BW
DRAWN	GS
CHECKED	MD

MICHAEL A. DEENAN 062.066817 LICENSED PROFESSIONAL ENGINEER OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE: NOT TO SCALE

CITY OF EVANSTON, ILLINOIS
SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

MECHANICAL
DETAILS

PROJECT NO.: 00280
DWG: M06
SHEET: 16 OF 20
DATE: DEC 2023 REV: 0

ONE LINE DIAGRAM

- TRANSFORMER
- UTILITY METERING
- DIGITAL METERING
- SWITCH
- FUSIBLE AND SWITCH
- FUSE
- CIRCUIT BREAKER
- GROUNDING ELECTRODE CONDUCTOR
- CURRENT TRANSFORMER
- CABLE LUGS

POWER SYMBOLS

CEILING MOUNTED	WALL MOUNTED	FLOOR BOX	POKE-THROUGH	
				DUPLEX RECEPTACLE
				DOUBLE DUPLEX RECEPTACLE
				DUPLEX RECEPTACLE CRITICAL BRANCH
				DOUBLE DUPLEX RECEPTACLE – CRITICAL BRANCH
				DUPLEX RECEPTACLE – SPLIT WIRED
				DOUBLE DUPLEX RECEPTACLE – SPLIT WIRED
	P	P	P	JUNCTION BOX WITH FLEXIBLE CONDUIT TO FINAL EQUIPMENT OR FURNITURE SYSTEM POWER CONNECTION.

WP XX — ADJACENT LETTERS IN THE ABOVE INDICATE THE FOLLOWING:

"XX"	CIRCUIT NUMBER
"EP"	EXPLOSION PROOF
"GFI"	GROUND FAULT CIRCUIT INTERRUPTER
"IG"	ISOLATED GROUND
"TP"	TAMPER RESISTANT (SAFETY-TYPE)
"TVSS"	TRANSIENT VOLTAGLE SURGE SUPPRESSION
"WP"	WATER PROOF
"XX"	CIRCUIT NUMBER

- DUPLEX RECEPTACLE – MOUNTED 6" ABOVE COUNTER
- SPECIAL OUTLET. SEE SPECIAL OUTLET SCHEDULE FOR MORE INFORMATION.
- TYPICAL SPECIAL OUTLET. SEE SPECIAL OUTLET SCHEDULE FOR MORE INFORMATION.
- PUSH BUTTON STATION
- THERMOSTAT
- 2P $ XX — MANUAL MOTOR CONTROL

"XX"	CIRCUIT NUMBER
"K"	KEY OPERATED
"P"	PILOT LIGHT
"TH"	THERMAL OVERLOAD PROTECTION
"2P"	2 POLE SWITCH
"3P"	3 POLE SWITCH

- MOTOR – SEE SCHEDULE
- AS/AF — FUSED DISCONNECT SWITCH, "AS" INDICATES AMPERE RATING OF SWITCH AND "AF" INDICATED AMPERE RATING OF FUSE
- NON-FUSED DISCONNECT SWITCH
- A — COMBINATION STARTER
- VFD — VERIABLE FREQUENCY DRIVE
- C — CONTACTOR
- T — TRANSFORMER
- SPD — SURGE PROTECTION DEVICE

GENERAL SYMBOLS

- CONDUIT RUN CONCEALED IN CEILING OR WALL
- CONDUIT RUN CONCEALED IN OR BELOW FLOOR
- CONDUIT RUN EXPOSED ON CEILING OR WALL

ARROWHEAD DENOTES HOMERUN TO PANELBOARD. SLASH LINES INDICATE QUANTITY OF WIRES: NEUTRAL WIRE SHOWN AS A LONG LINE, PHASE WIRES SHOWN AS SHORT LINES, AND GROUND WIRE SHOWN AS A LONG LINE WITH A DOT.

- CONDUIT STUB
- CONDUIT STUBBED UP
- CONDUIT STUBBED DOWN
- MULTI-OUTLET ASSEMBLY/ SURFACE MOUNTED RACEWAY WITH DEVICES AS INDICATED
- PB — PULL BOX
- J — JUNCTION BOX – EXPOSED OR IN CEILING
- J — JUNCTION BOX – WALL MOUNTED
- XXX / 00 — EQUIPMENT IDENTIFICATION TAG
- # — KEYED NOTE
- END CAP
- BREAK
- FLEXIBLE CONDUIT

GROUNDING SYMBOLS

- GROUND BUS
- GROUNDING PIGTAIL
- COLD WATER PIPE

COMMUNICATIONS

- INTERCOM PUSH BUTTON STATION
- CCTV / PTZ — CLOSED CIRCUIT TELEVISION CAMERA; PTZ – PAN-TILT-ZOOM
- S — SPEAKER/HORNS, CEILING OR WALL MOUNTED
- KP — KEYPAD
- ML — MAGNETIC LOCK
- ICP — INTERCOM CONTROL PANEL
- PP — PUSH PLATE STATION
- PB — PULL BOX

WALL MOUNTED	FLOOR BOX	POKE-THROUGH	CEILING MOUNTED	
				TELEPHONE/DATA OUTLET (TWO JACKS & CAT6 CABLES)
J T	T	T		JUNCTION BOX WITH FLEXIBLE CONDUIT TO FINAL EQUIPMENT OR FURNITURE SYSTEM COMMUNICATION CONNECTION.

SUBSCRIPT INDICATES THE FOLLOWING FOR WALL MOUNTED OUTLETS, (UNO):

"H"	HANDICAP MOUNTED AT 48" AFF
"P"	PAY PHONE MOUNTED AT 54" AFF
"W"	WALL MOUNTED AT 54" AFF
"C"	ABOVE COUNTER

GENERAL NOTES

ALL THE FOLLOWING NOTES APPLIES TO ALL ELECTRICAL DRAWINGS.

1. THE CONTRACTOR SHALL PROVIDE ALL LABOR AND MATERIAL NECESSARY FOR A COMPLETE AND FUNCTIONING ELECTRICAL SYSTEM.
2. MATERIALS AND INSTALLATION SHALL COMPLY WITH CODES, LAWS AND ORDINANCES OF FEDERAL, STATE AND LOCAL GOVERNING BODIES HAVING JURISDICTION.
3. MATERIALS AND EQUIPMENT SHALL BE LISTED AND/OR LABELED BY U.L., ETL, CSA OR ANOTHER RECOGNIZED TESTING LAB.
4. THE CONTRACTOR SHALL SECURE FOR ALL PERMITS, GOVERNMENTAL FEES, TAXES AND LICENSES NECESSARY FOR PROPER EXECUTION AND COMPLETION OF THE ELECTRICAL WORK. CITY WILL WAIVE BUILDING PERMIT FEE FOR THE PROJECT.
5. THE CONTRACTOR SHALL PREPARE AND SUBMIT SHOP DRAWINGS TO GOVERNMENTAL AGENCIES AND UTILITY COMPANIES FOR THEIR APPROVAL WHEN IT IS REQUIRED TO SECURE PERMIT.
6. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER OF ANY MATERIALS OR APPARATUS BELIEVED TO INADEQUATE, UNSUITABLE, VIOLATION OF LAWS, ORDINANCES, RULES OR REGULATIONS OF AUTHORITIES HAVING JURISDICTION.
7. THE CONTRACTOR SHALL CAREFULLY EXAMINE THE CONTRACT DOCUMENTS, VISIT THE SITE, AND THOROUGHLY BECOME FAMILIAR WITH THE BUILDING STANDARDS AND LOCAL CONDITIONS RELATING TO THE WORK. FAILURE TO DO SO WILL NOT RELIEVE THE CONTRACTOR OF THE OBLIGATIONS OF THE CONTRACT.
8. ALL MATERIALS, AND EQUIPMENT SHALL BE ERECTED, INSTALLED, CONNECTED, CLEANED ADJUSTED, TESTED, CONDITIONED, AND PLACED IN SERVICE IN ACCORDANCE WITH THE MANUFACTURER'S DIRECTIONS AND RECOMMENDATIONS.
9. ALL CUTTING, DRILLING AND PATCHING OF MASONRY STEEL OR IRON WORK BELONGING TO THE BUILDING MUST BE DONE BY THIS CONTRACTOR IN ORDER THAT THEIR WORK MAY BE PROPERLY INSTALLED, BUT UNDER NO CONDITIONS MAY STRUCTURAL WORK BE CUT, EXCEPT AT THE DIRECTIONS OF THE ARCHITECT/ENGINEER OR THEIR REPRESENTATIVE.
10. PROVIDE "AS-BUILT" DRAWINGS AND SUBMIT FOR APPROVAL TO THE ARCHITECT/ENGINEER.
11. EXCEPT AS NOTED OTHERWISE, ALL WORK REQUIRED FOR THE INSTALLATION, INCLUDING LABOR, EQUIPMENT AND MATERIALS SHALL BE IN STRICT COMPLIANCE WITH THE BUILDING STANDARDS.
12. PROVIDE COMPLETE METAL RACEWAY SYSTEMS AND ENCLOSURES FOR ALL LIGHTING/ POWER/SIGNAL WIRING THROUGHOUT THE EXTENT OF THE REQUIRED SYSTEMS.
13. MINIMUM CONDUIT SIZE SHALL BE 3/4" C. ALL WIRES AND CABLES SHALL BE INSTALLED IN CONDUIT SYSTEM.
14. NUMBERED CIRCUITS ARE CREATED FOR THE CONVENIENCE OF DESIGN ONLY. DESIGN INTENT MUST BE FOLLOWED THROUGHOUT, INDICATE THE CIRCUIT NUMBERS USED ON THE "AS-BUILT" DRAWINGS.
15. ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY WIRING, RACEWAY, BOXES, AND RECEPTACLES FOR A COMPLETE ELECTRICAL INSTALLATION. PROVIDE CIRCUITS AS REQUIRED VIA JUNCTION BOXES WITH FLEXIBLE CONDUIT CONNECTIONS. COORDINATE ALL JUNCTION BOX LOCATIONS WITH ARCHITECT, FURNITURE LAYOUT, AND STRUCTURAL BEAMS PRIOR TO WORK.
16. PROVIDE #12 AWG WIRING FOR ALL 20A GENERAL PURPOSE CIRCUITS LESS THAN 100 FEET AND #10 AWG WIRING FOR ALL 20A GENERAL PURPOSE CIRCUITS LONGER THAN 100 FEET. MINIMUM WIRE SIZE IS #12 UNLESS NOTED OTHERWISE.
17. CONTRACTOR SHALL PROVIDE COMPLETE CONDUIT SYSTEM, AND CABLES INCLUDING FACEPLATE FOR LOW VOLTAGE CABLES.
18. PROVIDE A DEDICATED NEUTRAL IN ALL 120V, 1PH CIRCUITS PER NEC 210.4 FOR MULTI-WIRE CIRCUITS.
19. PROVIDE ARC FLASH LABEL ON ALL POWER DISTRIBUTION EQUIPMENT PER SPECIFICATION 260573.

ABBREVIATIONS

NOTE: ABBREVIATIONS ARE ALPHABETICALLY LISTED BY DESCRIPTION.

ABBREV.	DESCRIPTION
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AC	ALTERNATING CURRENT
AL	ALUMINUM
AMP	AMPERE
AIC	AMPERES INTERRUPTING CAPACITY
ANN	ANNUNCIATOR
BAS	BUILDING AUTOMATION SYSTEM
BDG	BUILDING DISTRIBUTION FRAME
CUH	CABINET UNIT HEATER
CATV	CABLE TELEVISION
cd	CANDELA
CEC	CHICAGO ELECTRIC CODE
CCT	CIRCUIT
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
COAX	COAXIAL
CECO	COMMONWEALTH EDISON COMPANY
C	CONDUIT
CU	COPPER
CT	CURRENT TRANSFORMER
DC	DIRECT CURRENT
DS	DISCONNECT SWITCH
ELEC	ELECTRIC
EMT	ELECTRIC METALLIC TUBING (THIN WALL CONDUIT)
EUH	ELECTRIC UNIT HEATER
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EQ	EQUAL
EQIP	EQUIPMENT
E, EX	EXISTING
ERL	RELOCATED EXISTING
ER	EXISTING TO BE REMOVED
FPB	FAN POWERED BOX
FA	FIRE ALARM
FVNR	FULL VOLTAGE NON REVERSING
FVR	FULL VOLTAGE REVERSING
FS	FUSED SWITCH
GRC	GALVANIZED RIGID CONDUIT
GEN	GENERATOR
GRD	GROUND
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFI	GROUND FAULT INTERRUPTER
HZ	HERTZ (CYCLES/SECOND)
HV	HIGH VOLTAGE
HP	HORSE POWER
IDF	INTERMEDIATE DISTRIBUTION FRAME
IMC	INTERMEDIATE GRADE CONDUIT
IC	INTERRUPTING CAPACITY
JB	JUNCTION BOX
KVA	KILO VOLT-AMPERE
KW	KILOWATT
KWH	KILOWATT-HOUR
KO	KNOCKOUT
LTG	LIGHTING
LV	LOW VOLTAGE
MDF	MAIN DISTRIBUTION FRAME
MAN	MANUAL
MFR	MANUFACTURER
MOCP	MAXIMUM OVER CURRENT PROTECTION
MCA	MINIMUM CIRCUIT AMPERES
MTR	MOTOR
MTD	MOUNTED
NEC	NATIONAL ELECTRIC CODE
N	NEUTRAL
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
OCP	OVERCURRENT PROTECTION
PCU	PACKAGED CONTROL UNIT
PH	PHASE
PVC	POLYVINYL COLORIDE
PWR	POWER
PB	PULL BOX
TYP	TYPICAL
UH	UNIT HEATER
VFD	VARIABLE FREQUENCY DRIVE
V	VOLT
VA	VOLT-AMPERE
W	WATT

BID SET

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ANIL AHUJA 062-046514 REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS
SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

GREELEY AND HANSEN
A TYLin Company
100 SOUTH WACKER DRIVE, SUITE 1400
CHICAGO, ILLINOIS 60606

DESIGNED	CCJM
DRAWN	CCJM
CHECKED	CCJM

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE

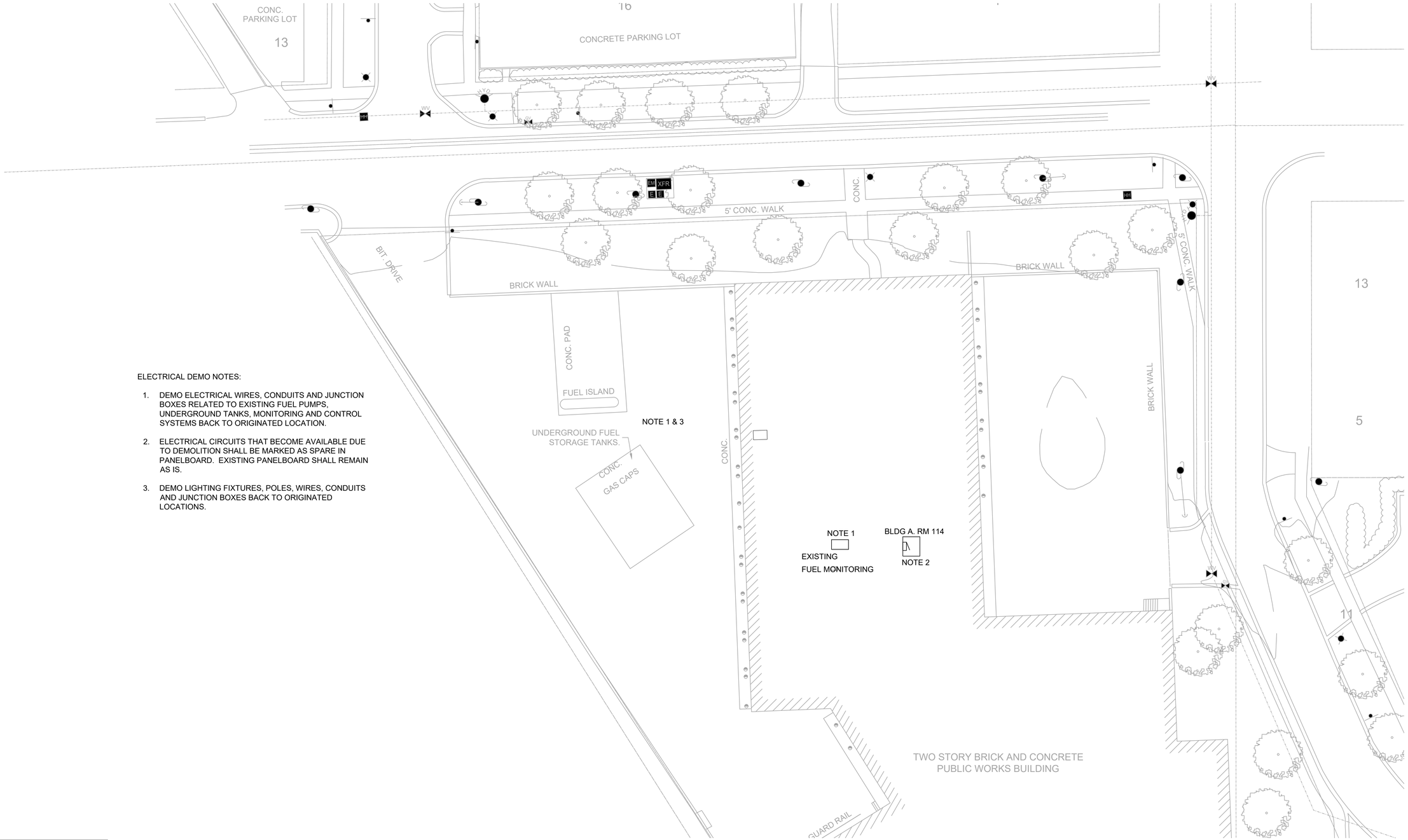
CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

ELECTRICAL

ELECTRICAL NOTES, SYMBOLS & ABBREVIATIONS

PROJECT NO.: 00280
DWG: E01
SHEET: 17 OF 20
DATE: DEC 2023 REV: -



ELECTRICAL DEMO NOTES:

1. DEMO ELECTRICAL WIRES, CONDUITS AND JUNCTION BOXES RELATED TO EXISTING FUEL PUMPS, UNDERGROUND TANKS, MONITORING AND CONTROL SYSTEMS BACK TO ORIGINATED LOCATION.

2. ELECTRICAL CIRCUITS THAT BECOME AVAILABLE DUE TO DEMOLITION SHALL BE MARKED AS SPARE IN PANELBOARD. EXISTING PANELBOARD SHALL REMAIN AS IS.

3. DEMO LIGHTING FIXTURES, POLES, WIRES, CONDUITS AND JUNCTION BOXES BACK TO ORIGINATED LOCATIONS.

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BID SET

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SCALE

CITY OF EVANSTON, ILLINOIS

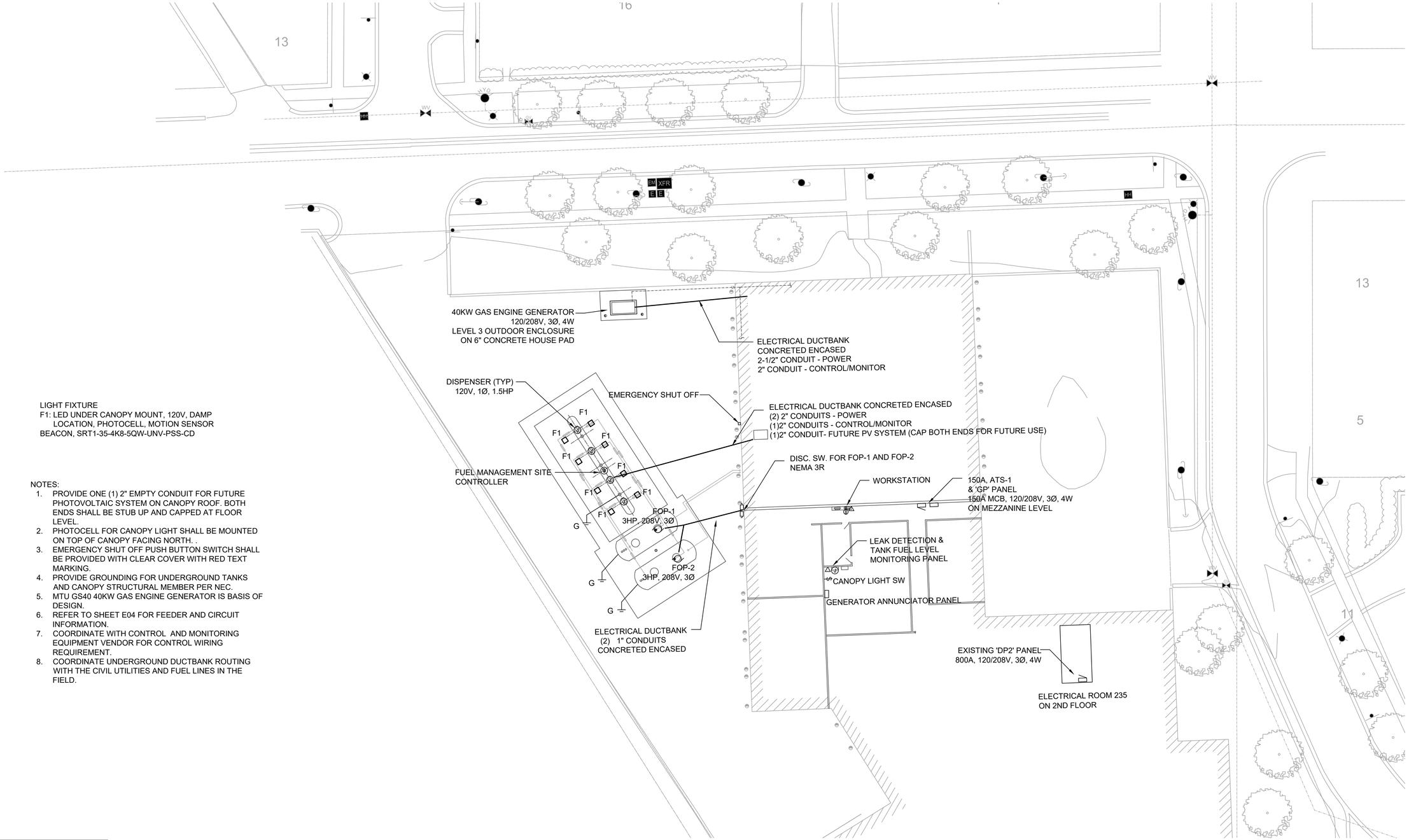
SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

ELECTRICAL

ELECTRICAL DEMOLITION PLAN

PROJECT NO.: 00280
DWG: E02
SHEET: 18 OF 20
DATE: DEC 2023 REV: -

G:\B+A PROJECTS\2023 JOBS\2317-001 EVANSTON SERVICE CENTER - NORTH FUEL ISLAND DESIGN\DRAWINGS\ELECTRICAL\E02.DWG JLEE



LIGHT FIXTURE
F1: LED UNDER CANOPY MOUNT, 120V, DAMP LOCATION, PHOTOCELL, MOTION SENSOR
BEACON, SRT1-35-4K8-5QW-UNV-PSS-CD

NOTES:

1. PROVIDE ONE (1) 2" EMPTY CONDUIT FOR FUTURE PHOTOVOLTAIC SYSTEM ON CANOPY ROOF. BOTH ENDS SHALL BE STUB UP AND CAPPED AT FLOOR LEVEL.
2. PHOTOCELL FOR CANOPY LIGHT SHALL BE MOUNTED ON TOP OF CANOPY FACING NORTH. .
3. EMERGENCY SHUT OFF PUSH BUTTON SWITCH SHALL BE PROVIDED WITH CLEAR COVER WITH RED TEXT MARKING.
4. PROVIDE GROUNDING FOR UNDERGROUND TANKS AND CANOPY STRUCTURAL MEMBER PER NEC.
5. MTU GS40 40KW GAS ENGINE GENERATOR IS BASIS OF DESIGN.
6. REFER TO SHEET E04 FOR FEEDER AND CIRCUIT INFORMATION.
7. COORDINATE WITH CONTROL AND MONITORING EQUIPMENT VENDOR FOR CONTROL WIRING REQUIREMENT.
8. COORDINATE UNDERGROUND DUCTBANK ROUTING WITH THE CIVIL UTILITIES AND FUEL LINES IN THE FIELD.

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SEAL AFFIXED 12-08-2023 EXP. 11-30-2025

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE

CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

ELECTRICAL

ELECTRICAL POWER PLAN

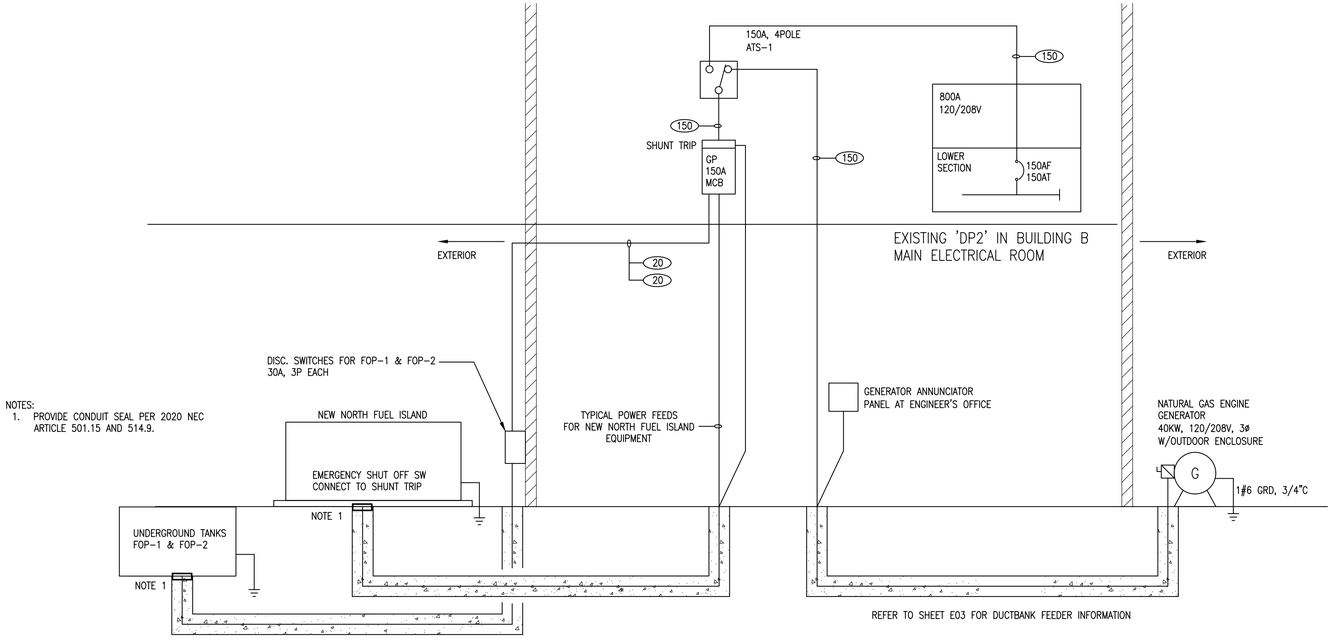
PROJECT NO.: 00280
DWG: E03
SHEET: 19 OF 20
DATE: DEC 2023 REV: -

BID SET

NEW PANELBOARD: GP				LOCATION: ELECTRICAL ROOM									
VOLTAGE: [X] 208Y/120V; 3Ø, 4 W; S/N [ ] 480Y/277V; 3Ø, 4 W; S/N													
MAINS: 150 AMPERES [ ] MAIN LUGS ONLY [X] SHUNT TRIP DEVICE [X] MAIN CIRCUIT BREAKER TRIP/FUSE RATING: 150													
INTERRUPTING RATINGS, SYMMETRICAL AMPERES: MAIN BREAKER: 42K AIC BRANCHES: 22K AIC													
MOUNTING: [X] SURFACE [ ] FLUSH [ ] BETWEEN FLANGES OF A COLUMN ENCLOSURE: NEMA 1													
SERVES	VOLTAMPS			CKT NO.	A	B	C	CKT NO.	VOLTAMPS			SERVES	
	A	B	C						A	B	C		
FUEL DISPENSER	1440			1	20			2	280			CANOPY LIGHTS	
FUEL DISPENSER		1440		3	20			4		1500		GENERATOR BATTERY CHARGE	
FUEL DISPENSER			1440	5	20			6			500	GENERATOR ENCLOSURE LGT/RCPT	
FUEL DISPENSER	1440			7	20			8	1500			GENERATOR HEATER	
CONTROL/MONITORING @ ISLAND		1000		9	20			10		1273			
FUEL PUMP (FOP-1)			1273	11	30			12			1273	FUEL PUMP (FOP-2)	
	1273			13				14	1273				
		1273		15	20			16					
LEAK DETECTION SYSTEM			1000	17	20			18					
CONTROL/MONITORING @ BUILDING	1000			19	20			20					
WORKSTATION		500		21	20			22					
				23	20			24					
				25	20			26					
				27	20			28					
				29	20			30					
				31	20			32					
				33	20			34					
				35	20			36					
				37	20			38					
				39	20			40					
				41	20			42					
TOTAL	5153	4213	3713						3053	2773	1773	TOTAL	

TOTAL CONNECTED LOAD: 57A

Ø A	8206	
Ø B	6986	
Ø C	5486	
TOTAL	20678	VOLTAMPS



SINGLE LINE DIAGRAM
SCALE: NTS

FEEDER SCHEDULE

USE THIS TABLE UNLESS NOTED OTHERWISE ON THE DRAWINGS/PLANS

CIRCUIT BREAKER/FUSE SIZE (AMPERES)	FEEDER SIZE (AWG OR KCMIL) (NOTE 8)	GROUND SIZE (AWG OR KCMIL)	CONDUIT SIZE	NUMBER OF SETS	SERVICE ENTRANCE GROUND (AWG OR KCMIL)	SERVICE ENTRANCE GROUND CONDUIT SIZE
15	3#12	1#12	3/4	1	1#8	3/4
20	3#12	1#12	3/4	1	1#8	3/4
25	3#12	1#12	3/4	1	1#8	3/4
30	3#10	1#10	3/4	1	1#8	3/4
35	3#8	1#10	1	1	1#8	3/4
40	3#8	1#10	1	1	1#8	3/4
45	3#6	1#10	1 1/4	1	1#8	3/4
50	3#6	1#10	1 1/4	1	1#8	3/4
60	3#4	1#8	1 1/4	1	1#8	3/4
70	3#4	1#8	1 1/2	1	1#8	3/4
80	3#3	1#8	1 1/2	1	1#8	3/4
90	3#2	1#8	1 1/2	1	1#8	3/4
100	3#1	1#8	2	1	1#6	3/4
110	3#1	1#6	2	1	1#6	3/4
125	3#1/0	1#6	2	1	1#6	3/4
150	3#1/0	1#6	2 1/2	1	1#6	3/4
175	3#2/0	1#6	2 1/2	1	1#4	3/4
200	3#3/0	1#6	2 1/2	1	1#4	3/4

NOTES:

1. FEEDERS AND BRANCH CIRCUITS ARE SIZED FOR INSTALLATION IN CONDUITS, NOT APPLICABLE FOR OTHER RACEWAYS.

2. ALL SERVICE ENTRANCE UNDERGROUND CONDUITS SHALL BE CONCRETE ENCASED.

3. ALL EXPOSED CONDUIT UP TO 8'-0 SHALL BE RGS AND ALL OUTDOOR CONDUIT SHALL BE RGS.

4. HVAC MOTOR CIRCUIT BREAKERS SHALL BE HACR TYPE.

5. ALL CONDUCTORS SHALL BE COPPER.

6. FEEDER SIZES BASED ON AMBIENT TEMPERATURE OF 30 DEG. C (80 DEG. F) COPPER THWN/THHN CONDUCTORS AT TEMPERATURE RATING OF 75 DEG.C

7. ALL FEEDER SIZES ARE BASED ON MAXIMUM 100' CIRCUIT LENGTH AND MAXIMUM THREE CURRENT CARRYING CONDUCTORS AND GROUND PER RACEWAY. INCREASE FEEDER SIZE TO NEXT HIGHER NUMBER FOR LONGER LENGTHS AND MORE THAN THREE CURRENT CARRYING CONDUCTORS. DERATE PER NEC.

8. INSTEAD OF 3 WIRES AS SHOWN IN THE SCHEDULE, 4 WIRES ARE REQUIRED FOR DISTRIBUTION SYSTEMS THAT REQUIRE NEUTRAL WIRE SUCH AS PANELBOARDS AND SPECIAL MECHANICAL EQUIPMENT. REFER TO EQUIPMENT SCHEDULE IN MECHANICAL DRAWINGS AND PANEL SCHEDULES AND ONE LINE DIAGRAMS IN ELECTRICAL DRAWINGS FOR EXACT FEEDER QUANTITY REQUIRED.

9. FEEDERS SERVING COMPUTER CIRCUIT PANELS WITH 200% NEUTRAL AND IG SHALL HAVE DOUBLE NEUTRAL AND DOUBLE GROUND UP TO SERVING TRANSFORMER OR MAIN SERVICE BOARD. CONDUIT SIZE SHALL MEET NEC REQUIREMENTS. CONTRACTOR TO VERIFY IN FIELD BEFORE BID.

10. IDENTIFICATION OF UNGROUNDED CONDUCTORS WHERE MORE THAN ONE NOMINAL VOLTAGE SYSTEM EXISTS IN BUILDING. EACH GROUNDED CONDUCTOR OF A MULTIWIRE BRANCH CIRCUIT WHERE ACCESSIBLE, SHALL BE IDENTIFIED BY PHASE AND SYSTEM. THIS MEANS OF IDENTIFICATION SHALL BE PERMITTED TO BE BY SEPARATE COLOR CODING, MARKING TAPE, TAGGING, OR OTHER APPROVED MEANS AND SHALL BE PERMANENTLY POSTED AT EACH BRANCH-CIRCUIT PANELBOARD.

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DESIGNED	CCJM	
DRAWN	CCJM	
CHECKED	CCJM	

NO.	DATE	APPD	REVISION DESCRIPTION

SCALE

CITY OF EVANSTON, ILLINOIS

SERVICE CENTER
NORTH FUEL ISLAND REPLACEMENT

ELECTRICAL

ELECTRICAL SCHEDULES & SINGLE LINE DIAGRAM

PROJECT NO.: 00280
DWG: E04
SHEET: 20 OF 20
DATE: DEC 2023 REV: -

BID SET

May 3, 2023

O'BRIEN & ASSOCIATES, INC.

Greeley and Hansen
100 S. Wacker Drive, Suite 1400
Chicago, IL 60606

Attention: Mr. Mike Debnar

Job No. 23103

Re: Geotechnical and Environmental Engineering Services for the Evanston Service Center North Fuel Island Replacement, Evanston, Illinois

Dear Mr. Debnar:

We have completed the geotechnical and environmental investigation for the proposed Evanston Service Center North Fuel Island Replacement located at 2020 Asbury Avenue, Evanston, Illinois. The project involves the replacement and reorientation of the north fuel island while maintaining full functionality to the south fuel island. The north fuel island will have one 15,000-gallon diesel underground storage tank (UST) and one 15,000-gallon unleaded UST with a new 60-ft long by 30-ft wide by 16-ft high canopy to better protect the island's fueling equipment and employees. Based on information obtained from the Illinois EPA and the Illinois Office of the State Fire Marshall, the current fuel island includes four (4) 10,000 gallon diesel and gasoline USTs that were installed in 1981.

The purpose of this report is to describe the subsurface conditions encountered in the borings, to analyze and evaluate the data obtained, and to submit preliminary recommendations regarding the design and construction of the proposed improvements and to determine if there have been any petroleum product releases resulting in contaminated conditions that need to be addressed during site development.

Exploration and Testing Procedures

Two (2) soil borings (B-1 and B-2) were performed April 17, 2023 with a Deidrich track mounted drill rig. The borings were advanced to a maximum depth of 20.0' below ground surface by means of hollow stem augers. Included with this report is a boring location diagram showing the approximate location of the borings.

The general boring locations were provided by a representative of Greeley and Hansen. O'Brien & Associates Inc. (OBA) personnel laid out the boring locations by taping distances and estimating right angles and the locations should be considered approximate.

Representative samples were obtained employing split spoon sampling procedures in accordance with ASTM Specification D-1586. Split spoon sampling involves driving a 2.0 inch outside diameter split-barrel sampler into the soil with a 140-pound weight falling freely through a distance of 30 inches. The number of blows required to advance the sampler from 6.0 to 18.0 inches is termed the Standard Penetration Resistance (N) and is included on the

boring logs. The N value is an indication of the relative density of the soil. Samples obtained in the field were returned to our laboratory for further examination and testing.
Since environmental sampling was also performed for this investigation, prior to initiating drilling operations all downhole drilling/sampling equipment was cleaned to prevent cross contamination of the soil samples. Drilling and sampling operations were supervised by an OBA Project Manager experienced in performing environmental investigations to observe materials for indications of contamination. Auger cuttings were observed during drilling for visual/olfactory indications of petroleum contamination. To prevent cross contamination between sampling events, the spilt barrel used to recover the samples was cleaned by being washed with an Alconox detergent and rinsed with potable water prior to reuse and the OBA sampler wore clean, disposable nitrile gloves which were changed each time environmental soil samples were handled.

The geotechnical testing program consisted of performing water content, density and either unconfined compression (Rimac) or calibrated penetrometer tests on the cohesive samples recovered. Water content tests were performed on the non-cohesive samples recovered. These tests were performed upon representative portions of the samples obtained in the field. In addition, torvane shear strength tests were also performed on representative portions of the softer clay soils. The torvane shear testing was performed using a GeoTest E-285 pocket vane shear tester. The results of the soil tests, along with a visual classification of the material based upon both a textural analysis and the Unified Soil Classification System, are indicated on the boring logs.

Samples were also selected from the borings to document the environmental conditions encountered at the site. The samples selected for analysis were placed into dedicated resealable freezer bags and glass vials and/or jars equipped with Teflon lined lids which had been provided by Eurofins TestAmerica (Eurofins), the independent, IEPA accredited laboratory selected to perform chemical testing. The vial containers consisted of pre-weighed vials with preservative solutions for Benzene-Toluene-Ethylbenzene-Xylenes (BTEX) analysis as per EPA Method 5035/8260. Each sample container was labeled with boring and sample number, site name, date and time of recovery. All vial samples were placed into an iced cooler to maintain a temperature near 4 degrees Celsius. The samples selected for chemical analysis were delivered to Eurofins within acceptable holding times.

Subsurface Conditions

Specific soil conditions encountered in the borings are indicated on the boring logs included with this report. As indicated on the logs, at boring B-1, medium dense crushed stone and sand fill was encountered beneath the pavement to a depth of 6.0’ below ground surface. These granular fill materials were also noted to have a strong petroleum odor. The granular fill was underlain by stiff gray clay soils that extended to a depth of 11.5’ below ground surface where the clay was noted to become much softer. The clay below a depth 11.5’ was noted to be wet (moisture content = 29% to 43%). At boring B-2, a loose to medium dense crushed stone fill was encountered beneath the pavement that extended to a depth of 6.0’ where a 2.5’ layer of medium stiff, wet (moisture content = 26%) gray clay with sand was encountered. The gray clay was underlain by a medium dense gray sand with clay that extended to a depth of 11.5’ where a very soft to medium stiff gray clay was encountered

that extended to the maximum depth of the boring, 20.0’ below ground surface. Similar moisture conditions for the deeper clay soils were noted in boring B-2 that were encountered in boring B-1.

No water was encountered in the borings during the drilling operation; however, based on the presence of gray soils encountered below the granular fill materials, it appears that the groundwater table is at or below a depth of 6.0' below the ground surface. Fluctuations in the amount of water accumulated and in the hydrostatic water table can be anticipated depending upon variations in precipitation and surface runoff. Longer term observations using piezometers would be necessary to more accurately establish groundwater conditions at the site.

Geotechnical Recommendations

Based on the information obtained from the borings performed at the site and the relatively light loads anticipated for the proposed fuel island, footing type foundations are recommended for the support of the proposed fuel island. The footing foundations can be situated within the existing granular fill or underlying native stiff clay soils.

For footings located within the granular fill or underlying native stiff clay soils, it is recommended that a maximum net allowable soil bearing pressure of 2,000 psf be employed. The design should provide that any exterior footings be located a sufficient distance below finished grade for adequate frost cover protection. This can be accomplished by situating them at or below a depth of 3.5-ft below finished grade. To avoid disproportionately small footing sizes, it is recommended that continuous footings have a minimum dimension of 18" and isolated footings a minimum dimension of 30".

Because of the variable and undocumented nature of the fill, some unsuitable soils may be encountered during the excavation for the footings. Any unsuitable soils found at the base of the footing should be removed and replaced with a compacted fill. The overexcavated areas can be backfilled to design grade with a crushed granular fill corresponding to IDOT gradation CA-1, CA-7 or CA-6. The CA-1 and CA-7 materials can be compacted by placing the material in lifts and tamping with a backhoe bucket. The CA-6 and clay fill materials should be placed in lifts not exceeding 9" in loose thickness and compacted to a recommended minimum 95% ASTM Specification D-1557 density. The moisture content of the fill should be controlled within +3% of the optimum moisture content. Structural fill utilized to support footings should be extend at least 6 inches beyond the proposed footing limits for each 12 inches of fill placed below the base of the footing.

The exposed subgrade at the bottom of the foundation excavation should be protected from deterioration due to freezing temperatures, or softening from standing water and/or construction traffic. Water should not be allowed to pond on the surface of the subgrade bearing soils as this could cause softening of the subgrade and subsequent loss of strength.

Because water was not encountered in the borings, no significant problems from ground water infiltration are anticipated and it is expected that standard sump pump and pit procedures should be adequate to dewater the excavations. Any surface water which

accumulates in the excavations during construction, along with any softened, disturbed or frozen soil, should be removed prior to the placement of any concrete. Sumps should be properly filtered to avoid pumping soil fines.

It is recommended that the foundation bearing soils be observed by a representative of O'Brien & Associates, Inc. prior to placement of concrete to check that the conditions are consistent with the recommendations contained in this report. The actual foundation level may need to be adjusted in the field based on observation and testing at the foundation base.

For the construction of the new tanks, the tank excavations may extend to the softer, wet clay soils found at a depth of 11.5' below ground surface. If these soils are encountered, it may be necessary to over-excavate the materials and provide a working platform or crushed stone. The stone can consist of a CA-1 or PGEs crushed concrete or crushed stone. All excavations that extend greater than 4 feet in depth should be designed in accordance with OSHA regulations with properly sloped or braced sides to prevent excavation instability. Side slopes of 1-1/2H:1V or flatter will be required where the fill materials are present. Stockpiles of material or equipment should not be placed near the top of excavation slopes.

For the construction of the new paved areas, the exposed subgrade should be thoroughly proofrolled prior to placing any fill. Because of the variable nature of the fill, some remediation may be required during construction. The remediation may require removal and replacement with a crushed granular material such as CA-1. The most appropriate and cost effective remediation method can best be evaluated after observing field conditions and proofrolling. Provisions should be included in the contract documents to allow for some remediation.

During the proofrolling procedure, the exposed subgrade is rolled with the heaviest piece of construction equipment available at the site, such as a heavily loaded tandem axle dump truck having a gross weight of not less than 25 tons. Any such deposits, as observed by deflection of the subgrade under the wheels of the proofrolling equipment, should be removed and replaced with an approved fill free of organic matter and debris.

Undercutting should be performed in such a manner as to minimize disturbance to the undercut subgrade. Heavy equipment traffic directly on the undercut subgrade should be minimized. The actual extent of undercut should be determined in the field at the time of construction by the geotechnical engineer. The proofrolling and backfilling operations should be inspected by a representative of O'Brien & Associates, Inc. to assure sufficient removal of unsuitable material and proper placement of backfill in accordance with our recommendations.

Environmental Conditions

Test results of the environmental testing are summarized on the boring logs and are included with this report along with a data summary table. The laboratory test results were compared to the limits in the Maximum Allowable Concentrations (MAC) Table for Chemical

Constituents in Uncontaminated Soil dated August 27, 2012 (35 Ill. Adm. Code 1100.Subpart F") to determine if the materials at the site are an Uncontaminated Soil per Clean Construction Demolition Debris (CCDD) regulations.

Following is a discussion regarding the conditions encountered at each of the borings. Descriptions *underlined and in italics* identify soils that are not be acceptable to be disposed of as an Uncontaminated Soil per CCDD criteria.

Boring B-1: *Soils with a strong petroleum type odor were noted within a depth range of 1.0' to 6.0' below ground surface*. The sample recovered from a depth of 3.5' was submitted for pH, BTEX, Methyl tert-butyl ether (MTBE), Polynuclear Aromatics (PNAs) and Lead which are the Contaminants of Concern (COC) for gasoline and diesel releases. The sample had a pH of 8.5 which is satisfactory for the CCDD pH range of 6.25 to 9.0; however, *Benzene was detected at 1.6 ppm which exceeds the CCDD MAC and the IEPA specified Soil Remediation Objective (SRO) of 0.030 ppm.* Toxicity Leaching Procedure (TCLP) Lead was detected 0.021 ppm which exceeds the CCDD MAC of 0.0075 ppm but the Total Lead of 15 ppm was satisfactory the alternative MAC of 107 ppm. The PNA Benzo[a]pyrene was detected at 0.1 ppm which slightly exceeds the most restrictive CCDD MAC of 0.09 ppm but is satisfactory for the alternative CCDD MACs for a site located in a Metropolitan Statistical Area (MSA) and Chicago. All other analytes were satisfactory for all MACs.

Boring B-2: No suspect odors or soil staining were noted during drilling operations at this boring. The sample recovered from a depth of 6.0' to 7.5' was submitted for the same contaminants as above. The sample had a pH of 7.3 which is satisfactory for the CCDD pH range of 6.25 to 9.0; however, *Benzene was detected at 0.064 ppm which exceeds the CCDD MAC and the IEPA specified SRO of 0.030 ppm.* Toxicity TCLP Lead was detected 0.018 ppm which exceeds the CCDD MAC of 0.0075 ppm but the Total Lead of 4.3 ppm was satisfactory for the alternative MAC of 107 ppm. All other analytes were satisfactory for all MACs.

Based on the suspect petroleum odors noted in boring B-1 and high Benzene encountered in both borings, it is our opinion that there are petroleum impacted soils to at least a depth of 8.5' below ground surface. If any construction activities ever occur in this area that generate construction spoils, these materials should be disposed of at a registered landfill in accordance with all regulations. Because excavations below 8.5' are also likely to be mixed with the upper soils, we recommend that for project considerations, all of the soils to be excavated from the site should be considered to be petroleum contaminated (non-CCDD) soils.

Based on the information obtained in this investigation, we are not able to determine if the petroleum impacted soils are related to a Leaking Underground Storage Tank (LUST) or from past overfilling and surficial spillage. Please note that it was beyond the scope of this investigation to delineate the extent of petroleum impacted soils. An expanded investigation would be required to properly identify the extent of these materials.

OBA has performed this environmental investigation in conformance with the scope and limitations of Illinois P.A. 096-1416. The information submitted in this environmental investigation has been based on available information. The data reviewed for this report

was limited to those data that were readily available. OBA is not responsible for conditions that were not disclosed in the course of review of the available data sources. This environmental investigation is not intended to be deemed a legal opinion. Environmental conditions are subject to change depending upon future activities and this assessment is descriptive of the present conditions at the project site. As any additional information becomes available, that information should be brought to our attention to determine if it affects our analysis and recommendations.

General Qualifications

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations that may occur across the site. In addition, it is recommended that OBA be retained to perform construction observation and thereby provide a complete professional geotechnical engineering service through the observational method.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by the geotechnical engineer. Also note OBA is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of the report's' subsurface data or engineering analyses without the express written authorization of OBA.

Very truly yours,

O'BRIEN & ASSOCIATES, INC.

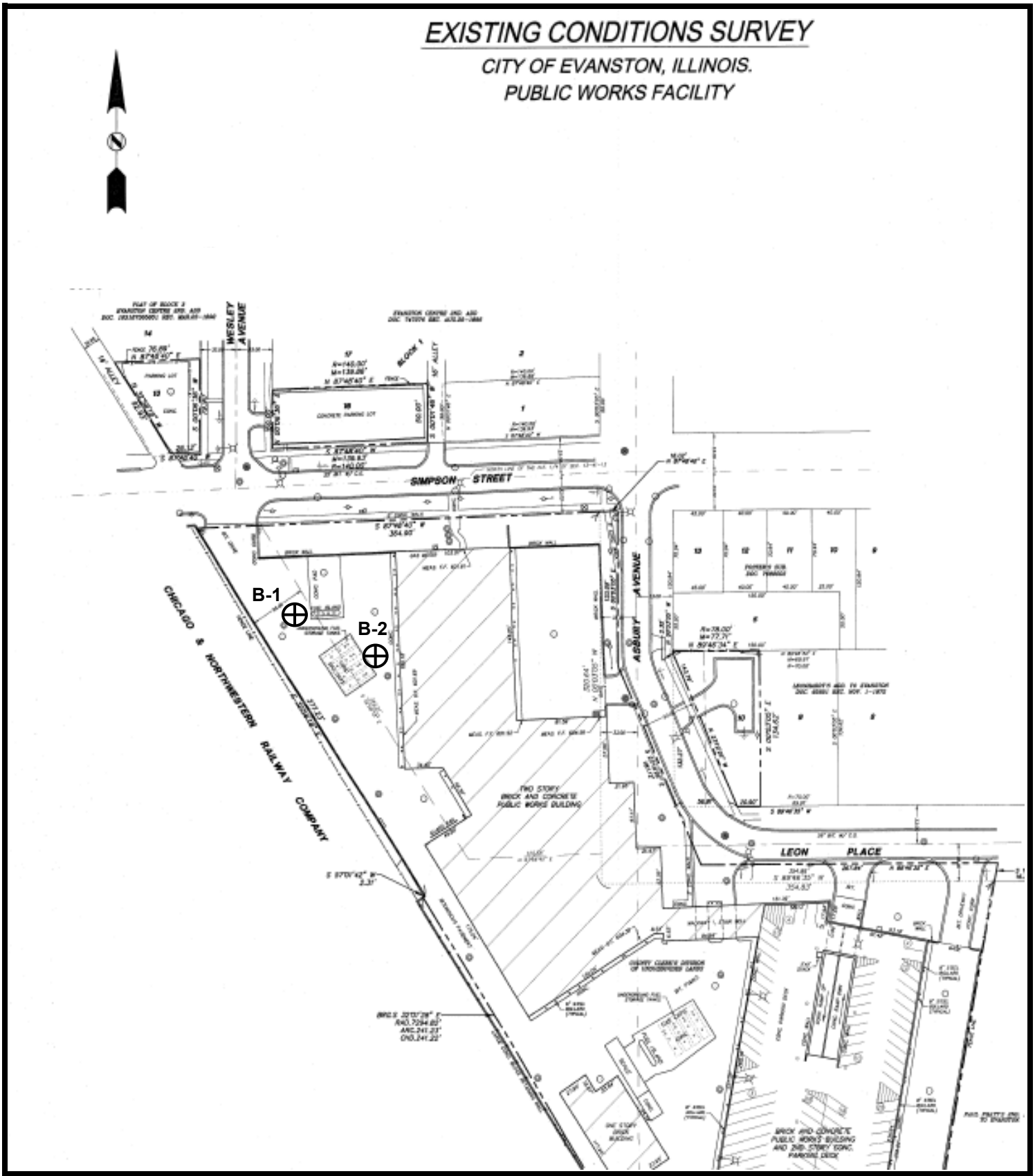
Vernon P. Brown
Engineering Geologist

Dixon O'Brien, P.E.
Vice President

DOB/vpb/je

enc.

EXP. 11/30/2023



SOIL BORING LOCATION DIAGRAM

Evanston Service Center North Fuel Island Replacement 2020 Asbury Avenue Evanston, Illinois	O'BRIEN & ASSOCIATES, INC. CONSULTING ENGINEERS 766 W. ALGONQUIN ROAD ARLINGTON HEIGHTS, ILLINOIS 60005 (847) 398-1441 ● (847) 398-2376	PREPARED BY	JE
		APPROVED BY	DOB
		DATE	4/18/2023
		JOB NO.	23103

NOT TO SCALE

Source: Engineering Resource Associates, Inc.

LOG OF BORING NO. B–1

CLIENT Greeley and Hansen	BORING LOCATION See Boring Location Diagram
PROJECT LOCATION Evanston Service Center, 2020 Asbury Ave., Evanston, Illinois	PROJECT DESCRIPTION Geotectnical & Environmental Investigation

DEPTH (ft.) BELOW GROUND SURFACE	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE	DESCRIPTION OF MATERIAL GROUND SURFACE ELEVATION 601.0	STANDARD PENETRATION "N"	Qp (tsf)	Qu (tsf)	MOISTURE CONTENT (%)	UNIT DRY WEIGHT (pcf)	REMARKS
	1	AS		10" ASPHALT, 6" CRUSHED STONE				1		
	2	SS		CRUSHED STONE–gray– medium dense (GW) Fill petroleum odor	22			4		
5.0	3	SS		WELL GRADED SAND with petroleum odor CLAY–black–medium dense (SW–SC) Fill	20			12		See COMMENT #1
	4	SS		SILTY CLAY–gray– stiff (CL–ML)	12	1.0	1.7	21	107	
10.0	5	SS		LEAN CLAY–gray– stiff (CL)	12	1.75	1.8	18	113	
15.0	6	SS		LEAN CLAY–gray– soft to stiff (CL) wet ***Torvane @ –14.0'*** ***Shear Strength = 1220psf***	6	0.75	0.9	29	95	
20.0	7	SS		***Torvane @ –19.0'*** ***Shear Strength = 360psf***	3	<0.25	0.4	43	78	4.7% organic content

END OF BORING

WATER LEVEL OBSERVATIONS		BORING STARTED	April 17, 2023	
Water Level While Drilling Dry ▼	O'BRIEN & ASSOCIATES, INC. CONSULTING ENGINEERS 766 W. ALGONQUIN RD./ARLINGTON HTS., IL 60005 (847)398–1441 * FAX(847) 398–2376	BORING COMPLETED	April 17, 2023	
Water Level After Boring Dry ▽		RIG	D–25	FOREMAN JE
▽		DRAWN	JE	APPROVED DOB
		OBA JOB No. 23103		SHEET 1 OF 1

No Discolorization noted during drilling/Petroleum Odor noted from –1.0' to –8.0'

COMMENT #1: Sample tested for pH, BTEX–MTBE, PNAs & Lead
pH = 8.5 which is satisfactory for MAC of 6.25 to 9.0
Benzene = 1.6 ppm which exceeds CCDD MAC of 0.03 PPM

All other analytes tested for <CCDD MSA MACs

LOG OF BORING NO. B–2

CLIENT	BORING LOCATION
Greeley and Hansen	See Boring Location Diagram
PROJECT LOCATION	**PROJECT DESCRIPTION**
Evanston Service Center, 2020 Asbury Ave., Evanston, Illinois	Geotectnical & Environmental Investigation

DEPTH (ft.) BELOW GROUND SURFACE	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE	DESCRIPTION OF MATERIAL	STANDARD PENETRATION "N"	Qp (tsf)	Qu (tsf)	MOISTURE CONTENT (%)	UNIT DRY WEIGHT (pcf)	REMARKS
				GROUND SURFACE ELEVATION 601.0						
	1	AS		10" ASPHALT, 6" CRUSHED STONE				1		
	2	SS		CRUSHED STONE–gray– loose to medium dense (GW) Fill	21			2		
5.0	3	SS			10			5		
	4	SS		LEAN CLAY with SAND–gray– medium stiff (CL) wet	9	0.25	0.7	26	99	See COMMENT #1
10.0	5	SS		WELL GRADED SAND with CLAY–gray– medium dense (SW–SC)	13			23		
15.0	6	SS		LEAN CLAY–gray– very soft to medium stiff (CL) wet ***Torvane @ –14.0'*** ***Shear Strength = 1020psf***	7	<0.25	0.5	28	97	
20.0	7	SS		***Torvane @ –19.0'*** ***Shear Strength = 200psf***	3	<0.25		44		4.5% organic content
				END OF BORING						

WATER LEVEL OBSERVATIONS		BORING STARTED	April 17, 2023	
Water Level While Drilling Dry ▼		BORING COMPLETED	April 17, 2023	
Water Level After Boring Dry ▽		RIG	D–25	FOREMAN JE
▽		DRAWN	JE	APPROVED DOB
		OBA JOB No.	23103	SHEET 1 OF 1

O'BRIEN & ASSOCIATES, INC.
CONSULTING ENGINEERS
766 W. ALGONQUIN RD./ARLINGTON HTS., IL 60005
(847)398–1441 * FAX(847) 398–2376

No Discolorization or odors noted during drilling

COMMENT #1: Sample tested for pH, BTEX–MTBE, PNAs & Lead
pH = 7.3 which is satisfactory for MAC of 6.25 to 9.0
Benzene = 0.64 ppm which exceeds CCDD MAC of 0.03 PPM

All other analytes tested for <CCDD MACs

GENERAL NOTES

CLASSIFICATION

Chicago Building Code Textural Soil Classifications and Unified Soil Classifications are used.

Cohesionless Soils

Relative Density	No. of Blows per foot N
Very Loose	0 to 4
Loose	4 to 10
Medium	10 to 30
Dense	30 to 50
Very Dense	Over 50

Cohesive Soils

Consistency	Unconfined Compressive Strength - qu (tsf)
Very Soft	Less than 0.25
Soft	0.25 - 0.5
Medium	0.5 - 1.0
Stiff	1.0 - 2.0
Very Stiff	2.0 - 4.0
Hard	Over 4.0

TERMINOLOGY

Streaks are considered to be paper thick. **Lenses** are considered to be less than 2 inches thick. **Layers** are considered to be 6 inches or less thick. **Stratum** are considered to be greater than 6 inches thick.

DRILLING AND SAMPLING SYMBOLS

SS:	Split Spoon 1-3/8" I.D., 2" O.D.	HS:	Housel Sampler
ST:	Shelby Tube 2" O.D., except where noted	WS:	Wash Sample
AS:	Auger Sample	FT:	Fish Tail
DB:	Diamond Bit - NX: BX: AX	RB:	Rock Bit
CB:	Carboloy Bit - NX: BX: AX	WO:	Wash Out
OS:	Osterberg Sampler		

Standard "N" Penetration: Blows per foot of a 140 lb. hammer falling 30" on a 2" O.D. Split Spoon

WATER LEVEL MEASUREMENT SYMBOLS

WL:	Water	WD:	While Drilling
WCI:	Wet Cave In	BCR:	Before Casing Removal
DCI:	Dry Cave In	ACR:	After Casing Removal
WS :	While sampling	AB:	After Boring

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable ground water levels. In impervious soils, the accurate determination of ground water elevations is not possible in even several day's observation, and additional evidence on ground water elevations must be sought.

O'BRIEN & ASSOCIATES, INC.
766 WEST ALGONQUIN ROAD
ARLINGTON HEIGHTS, IL 60005
(847) 398-1441 FAXES (847) 398-2376

ORGANIC MATTER of SOILS
ASTM D 2974

Project Name Evanston Service Center North Fuel Island **Date** 5/3/23

Location 2020 Ashbury Avenue, Evanston, Illinois **Job No** 23103

Boring No	B-1	B-2
Sample No.	7	7
Depth	18.5'-20.0'	18.5'-20.0'
Sample Description	Clay-(CL)	Clay-(CL)
% Organic Content	4.7	4.5

Tested By AT

Project: Evanston Service Center-North Fuel Island
Sample Date: 4/17/23
Lab Name: Eurofins Chicago
OBA Job #: 23103

Metal
BTEX — **bold** — satisfactory for alternate MAC
PNAs — **red bold** — exceeds MAC

CCDD TACO-Derived Constituents in Uncontaminated Soil Code 1100.Subpart F				Maximum Allowable Concentration (MAC)	SampleID (Boring #/Sample # (Depth-ft)	
					B-1/S-3	B-2/S-4
Method	**CAS**	**Analyte**	**Note**	**mg/Kg***	(3.5-5.0)	(6.0-7.5)
6010B	7439-92-1	Lead	d,m	107	15	4.3
8260B	71-43-2	Benzene	b	0.03	**1.6**	**0.64**
8260B	100-41-4	Ethylbenzene		13	0.84	0.013
8260B	1634-04-4	Methyl tert-butyl ether	b	0.32	<0.021	0.053
8260B	108-88-3	Toluene	b	12	0.89	<0.0098
8260B	1330-20-7	Xylenes, Total	b	5.6	0.91	<0.015
8270D	83-32-9	Acenaphthene	b	570	0.051	<0.0074
8270D	120-12-7	Anthracene	b	12000	0.061	<0.0069
8270D	56-55-3	Benzo[a]anthracene - Chicago Limits	f	1.1	0.12	0.011
8270D	56-55-3	Benzo[a]anthracene - In Populated MSA exclude Chicago	f	1.8	0.12	0.011
8270D	56-55-3	Benzo[a]anthracene - Populated non MSA/Outside populated	g	0.9	0.12	0.011
8270D	50-32-8	Benzo[a]pyrene - Chicago Limits	f	1.3	0.1	<0.0080
8270D	50-32-8	Benzo[a]pyrene - In Populated MSA exclude Chicago	f	2.1	0.1	<0.0080
8270D	50-32-8	Benzo[a]pyrene - Populated non MSA/Outside populated	f	0.98	0.1	<0.0080
8270D	50-32-8	Benzo[a]pyrene - Outside populated	g	0.09	**0.1**	<0.0080
8270D	205-99-2	Benzo[b]fluoranthene - Chicago Limits	f	1.5	0.13	<0.0089
8270D	205-99-2	Benzo[b]fluoranthene - In Populated MSA exclude Chicago	f	2.1	0.13	<0.0089
8270D	205-99-2	Benzo[b]fluoranthene - Populated non MSA/Outside populated	g	0.9	0.13	<0.0089
8270D	207-08-9	Benzo[k]fluoranthene	g	9	0.044	<0.012
8270D	218-01-9	Chrysene	g	88	0.12	<0.011
8270D	53-70-3	Dibenz[a,h]anthracene - Chicago Limits	f	0.2	0.016	<0.0080
8270D	53-70-3	Dibenz[a,h]anthracene - In Populated MSA exclude Chicago	f	0.42	0.016	<0.0080
8270D	53-70-3	Dibenz[a,h]anthracene - Populated non MSA	f	0.15	0.016	<0.0080
8270D	53-70-3	Dibenz[a,h]anthracene - Outside populated	g	0.09	0.016	<0.0080
8270D	206-44-0	Fluoranthene	g	3100	0.26	<0.0077
8270D	86-73-7	Fluorene	b	560	0.039	<0.0058
8270D	193-39-5	Indeno[1,2,3-cd]pyrene - In Populated MSA exclude Chicago	f	1.6	0.082	<0.011
8270D	193-39-5	Indeno[1,2,3-cd]pyrene - Chicago Limits/Populated non MSA/Outside populated	g	0.9	0.082	<0.011
8270D	91-20-3	Naphthalene	g	1.8	0.15	<0.0064
8270D	129-00-0	Pyrene	g	2300	0.29	<0.0082
9045D	STL00204	pH	j	6.25-9.0	8.5	7.3
Standard CCDD Analytes Above/Additional Analytes Below						
6010B	7439-92-1	Lead - TCLP	---	0.0075 mg/L	**0.021**	**0.018**
8270D	208-96-8	Acenaphthylene	---	85**	NT	<0.060
8270D	191-24-2	Benzo[g,h,i]perylene	---	2,300**	NT	0.063
8270D	85-01-8	Phenanthrene	---	210**	NT	0.16

* unless otherwise noted NT: not tested NL: None Listed
** from Illinois EPA Toxicity Assessment Unit Oct 30, 2012
a = Concentrations are the results after using methods described in 35 IAC 1100.Subpart F for determining the Maximum Allowable Concentrations of chemical constituents in uncontaminated soils used as fill material at regulated fill operations.
b = Value is the TACO Class I Soil Component of the Groundwater Ingestion Exposure Route concentration (35 IAC 742.Appendix B, Tables A and B).
c = Value is the TACO-defined Acceptable Detection Limit (ADL) for the chemical in soil.
d = Value is the lowest TACO Class I concentration between column range 6.25 to 6.64 and column range 8.75 to 9.0 from the pH-Specific Soil Remediation Objectives table for Inorganic and Ionizing Organic Chemicals for the Soil Component of the Groundwater Ingestion Route (35 IAC 742.Appendix B, Table C). (See 35 IAC 1100.605(a)(2); 1100.605(a)(3)(A)).
e = Value is the location-specific allowable concentration based upon TACO-defined background values for inorganic chemicals (35 IAC 742.Appendix A, Table G). The location of the fill site determines the allowable concentration. Two background locations are defined; one for counties that are designated as Metropolitan Statistical Areas (MSA) (see Board Note, 35 IAC 742.Appendix A, Table G), the other for counties designated as a non-MSA.
f = Value is the location-specific allowable concentration based upon TACO-defined background values for polynuclear aromatic hydrocarbon chemicals (35 IAC 742.Appendix A, Table H). The location of the fill site

determines the allowable concentration. Three background locations are defined; one for areas within the corporate limits of the City of Chicago, another for populated areas (defined at 35 IAC Revised: August 27, 2012 742.200) in counties that are designated as Metropolitan Statistical Areas (MSA) (see Board Note, 35 IAC 742.Appendix A, Table G) excluding the City of Chicago, and the third for populated areas within non-MSA counties. No background concentrations have been defined for locations outside of populated areas; therefore, the maximum allowable concentrations in these locations are determined using 35 IAC 100.Subpart F.
g = Value is the lowest TACO Soil Remediation Objective by the ingestion or inhalation routes of exposure for the Residential and Construction Worker receptors (35 IAC 742.Appendix B, Tables A and B). When applicable, definitions for “MSA” and “populated area” are presented in 35 IAC 742.Appendix A, Table H and 35 IAC 742.200, respectively.
h = Value is the TACO Class I Soil Component of the Groundwater Ingestion Exposure Route value multiplied by 20.
i = Soil saturation concentration (Csat).
j = This chemical is of no concern for soil ingestion and no data are available to assess other routes of exposure. There is no soil concentration limit established for this constituent.
k = Value for PCBs is the highest allowable concentration requiring no controls based on USEPA TSCA (40 CFR 761) policy.
l = SW-846 methods may not support analytical detection at the concentration specified. Modified or alternative methods may be required to achieve the lowest practical detection level possible.
m = As an alternative to the subject maximum allowable concentration value, compliance verification may be determined by comparing soil sample extraction results (TCLP/SPLP) for this constituent to the respective TACO Class I Soil Component of the Groundwater Ingestion Exposure Route objective (35 Ill. Admin. Code 742. Appendix B, Table A). (See 35 IAC 1100.610(b)(1)(B); 1100.610(b)(3)(C)).
n = Elemental mercury is an inhalation hazard and is evaluated based upon the IRIS inhalation reference concentration for elemental mercury (CAS No. 7439-97-6). All other forms of mercury are evaluated using the IRIS oral reference dose for mercuric chloride (CAS No. 7487-94-7). The inhalation MAC only applies where elemental mercury is a contaminant of concern; the MAC for ionic mercury applies everywhere.
1 = the Maximum Allowable Concentration of 0.89 mg/kg for ionic mercury has been used. This is for sites not specifically identified as having elemental mercury as a contaminant of concern.

eurofins | Environment Testing

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

ANALYTICAL REPORT

PREPARED FOR

Attn: Mr. Vern Brown
O'Brien & Associates
766 Algonquin Rd
Arlington Heights, Illinois 60005

Generated 4/27/2023 2:41:00 PM

JOB DESCRIPTION

Evanston Service Center North Fuel Island

JOB NUMBER

500-232430-1

Eurofins Chicago
2417 Bond Street
University Park IL 60484

See page two for job notes and contact information.

myEOL

Job Notes

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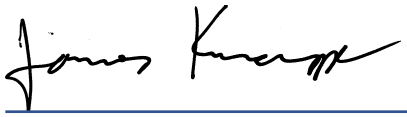

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Table of Contents

Case Narrative

Client: O'Brien & Associates
Job ID: 500-232430-1
Project/Site: Evanston Service Center North Fuel Island

Job ID: 500-232430-1

Laboratory: Eurofins Chicago

Narrative

Job Narrative
500-232430-1

Receipt
The samples were received on 04/18/23 12:10. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 5.6º C.

Receipt Exceptions
The Chain-of-Custody (COC) was improperly completed. Per client email, sample B-2 S-4 (500-232430-2) was collected at 1:15 pm, but recorded on the COC as collected at 10:20 am. Collection time in login recorded per client email.

Samples B-1 S-3 (500-232430-1) and B-2 S-4 (500-232430-2) marked for HOLD on COC. Client confirmed analysis.

GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC/MS Semi VOA
Method 8270D: The continuing calibration verification (CCV) analyzed in 500-709810 was outside the method criteria for the following analyte: Nitrobenzene-d5 (Surr). As indicated in the reference method, sample analysis may proceed; however, any detection for the affected analyte is considered estimated.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: O'Brien & Associates
Job ID: 500-232430-1
Project/Site: Evanston Service Center North Fuel Island

Client Sample ID: B-1 S-3
Lab Sample ID: 500-232430-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Benzene	1.6		0.013	0.0077	mg/Kg	50	☼	8260B	Total/NA
Toluene	0.89		0.013	0.0077	mg/Kg	50	☼	8260B	Total/NA
Ethylbenzene	0.84		0.013	0.0096	mg/Kg	50	☼	8260B	Total/NA
Xylenes, Total	0.91		0.026	0.012	mg/Kg	50	☼	8260B	Total/NA
Acenaphthene	0.051		0.038	0.0070	mg/Kg	1	☼	8270D	Total/NA
Acenaphthylene	0.012	J	0.038	0.0051	mg/Kg	1	☼	8270D	Total/NA
Anthracene	0.061		0.038	0.0065	mg/Kg	1	☼	8270D	Total/NA
Benzo[a]anthracene	0.12		0.038	0.0052	mg/Kg	1	☼	8270D	Total/NA
Benzo[a]pyrene	0.10		0.038	0.0075	mg/Kg	1	☼	8270D	Total/NA
Benzo[b]fluoranthene	0.13		0.038	0.0083	mg/Kg	1	☼	8270D	Total/NA
Benzo[g,h,i]perylene	0.061		0.038	0.012	mg/Kg	1	☼	8270D	Total/NA
Benzo[k]fluoranthene	0.044		0.038	0.011	mg/Kg	1	☼	8270D	Total/NA
Chrysene	0.12		0.038	0.011	mg/Kg	1	☼	8270D	Total/NA
Dibenz(a,h)anthracene	0.016	J	0.038	0.0075	mg/Kg	1	☼	8270D	Total/NA
Fluoranthene	0.26		0.038	0.0072	mg/Kg	1	☼	8270D	Total/NA
Indeno[1,2,3-cd]pyrene	0.082		0.038	0.010	mg/Kg	1	☼	8270D	Total/NA
Naphthalene	0.15		0.038	0.0059	mg/Kg	1	☼	8270D	Total/NA
Phenanthrene	0.27		0.038	0.0054	mg/Kg	1	☼	8270D	Total/NA
Pyrene	0.29		0.038	0.0077	mg/Kg	1	☼	8270D	Total/NA
Fluorene	0.039		0.038	0.0054	mg/Kg	1	☼	8270D	Total/NA
Lead	15		0.56	0.26	mg/Kg	1	☼	6010B	Total/NA
Lead	0.021	J B	0.050	0.0075	mg/L	1		6010B	TCLP
pH	8.5		0.2	0.2	SU	1		9045D	Total/NA

Client Sample ID: B-2 S-4
Lab Sample ID: 500-232430-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Benzene	0.64		0.017	0.0098	mg/Kg	50	☼	8260B	Total/NA
Ethylbenzene	0.013	J	0.017	0.012	mg/Kg	50	☼	8260B	Total/NA
Methyl tert-butyl ether	0.053	J	0.067	0.026	mg/Kg	50	☼	8260B	Total/NA
Benzo[a]anthracene	0.011	J	0.041	0.0056	mg/Kg	1	☼	8270D	Total/NA
Lead	4.3		0.54	0.25	mg/Kg	1	☼	6010B	Total/NA
Lead	0.018	J B	0.050	0.0075	mg/L	1		6010B	TCLP
pH	7.3		0.2	0.2	SU	1		9045D	Total/NA

This Detection Summary does not include radiochemical test results.

Method Summary

Client: O'Brien & Associates
Job ID: 500-232430-1
Project/Site: Evanston Service Center North Fuel Island

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	EET CHI
8270D	Semivolatile Organic Compounds (GC/MS)	SW846	EET CHI
6010B	Metals (ICP)	SW846	EET CHI
9045D	pH	SW846	EET CHI
Moisture	Percent Moisture	EPA	EET CHI
1311	TCLP Extraction	SW846	EET CHI
3010A	Preparation, Total Metals	SW846	EET CHI
3050B	Preparation, Metals	SW846	EET CHI
3541	Automated Soxhlet Extraction	SW846	EET CHI
5035	Closed System Purge and Trap	SW846	EET CHI

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET CHI = Eurofins Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Sample Summary

Client: O'Brien & Associates
Job ID: 500-232430-1
Project/Site: Evanston Service Center North Fuel Island

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
500-232430-1	B-1 S-3	Solid	04/17/23 10:20	04/18/23 12:10
500-232430-2	B-2 S-4	Solid	04/17/23 13:15	04/18/23 12:10

Client Sample ID: B-1 S-3
Date Collected: 04/17/23 10:20
Date Received: 04/18/23 12:10

Lab Sample ID: 500-232430-1
Matrix: Solid
Percent Solids: 85.3

Method: SW846 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	**1.6**		0.013	0.0077	mg/Kg	☼	04/17/23 10:20	04/23/23 19:44	50
Toluene	**0.89**		0.013	0.0077	mg/Kg	☼	04/17/23 10:20	04/23/23 19:44	50
Ethylbenzene	**0.84**		0.013	0.0096	mg/Kg	☼	04/17/23 10:20	04/23/23 19:44	50
Xylenes, Total	**0.91**		0.026	0.012	mg/Kg	☼	04/17/23 10:20	04/23/23 19:44	50
Methyl tert-butyl ether	ND		0.053	0.021	mg/Kg	☼	04/17/23 10:20	04/23/23 19:44	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*94*		*75 - 126*	*04/17/23 10:20*	*04/23/23 19:44*	*50*
Toluene-d8 (Surr)	*92*		*75 - 120*	*04/17/23 10:20*	*04/23/23 19:44*	*50*
4-Bromofluorobenzene (Surr)	*103*		*72 - 124*	*04/17/23 10:20*	*04/23/23 19:44*	*50*
Dibromofluoromethane	*94*		*75 - 120*	*04/17/23 10:20*	*04/23/23 19:44*	*50*

Method: SW846 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	**0.051**		0.038	0.0070	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Acenaphthylene	**0.012**	**J**	0.038	0.0051	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Anthracene	**0.061**		0.038	0.0065	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Benzo[a]anthracene	**0.12**		0.038	0.0052	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Benzo[a]pyrene	**0.10**		0.038	0.0075	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Benzo[b]fluoranthene	**0.13**		0.038	0.0083	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Benzo[g,h,i]perylene	**0.061**		0.038	0.012	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Benzo[k]fluoranthene	**0.044**		0.038	0.011	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Chrysene	**0.12**		0.038	0.011	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Dibenz(a,h)anthracene	**0.016**	**J**	0.038	0.0075	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Fluoranthene	**0.26**		0.038	0.0072	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Indeno[1,2,3-cd]pyrene	**0.082**		0.038	0.010	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Naphthalene	**0.15**		0.038	0.0059	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Phenanthrene	**0.27**		0.038	0.0054	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Pyrene	**0.29**		0.038	0.0077	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1
Fluorene	**0.039**		0.038	0.0054	mg/Kg	☼	04/25/23 08:39	04/27/23 00:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*68*		*37 - 147*	*04/25/23 08:39*	*04/27/23 00:25*	*1*
2-Fluorobiphenyl	*83*		*43 - 145*	*04/25/23 08:39*	*04/27/23 00:25*	*1*
Terphenyl-d14 (Surr)	*95*		*42 - 157*	*04/25/23 08:39*	*04/27/23 00:25*	*1*

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	**15**		0.56	0.26	mg/Kg	☼	04/21/23 09:24	04/25/23 22:13	1

Method: SW846 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	**0.021**	**J B**	0.050	0.0075	mg/L		04/20/23 16:28	04/24/23 21:49	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 9045D)	**8.5**		0.2	0.2	SU			04/19/23 17:18	1

Client Sample ID: B-2 S-4
Date Collected: 04/17/23 13:15
Date Received: 04/18/23 12:10

Lab Sample ID: 500-232430-2
Matrix: Solid
Percent Solids: 77.6

Method: SW846 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	**0.64**		0.017	0.0098	mg/Kg	☼	04/17/23 13:15	04/23/23 20:08	50
Toluene	ND		0.017	0.0098	mg/Kg	☼	04/17/23 13:15	04/23/23 20:08	50
Ethylbenzene	**0.013**	**J**	0.017	0.012	mg/Kg	☼	04/17/23 13:15	04/23/23 20:08	50
Xylenes, Total	ND		0.033	0.015	mg/Kg	☼	04/17/23 13:15	04/23/23 20:08	50
Methyl tert-butyl ether	**0.053**	**J**	0.067	0.026	mg/Kg	☼	04/17/23 13:15	04/23/23 20:08	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*94*		*75 - 126*	*04/17/23 13:15*	*04/23/23 20:08*	*50*
Toluene-d8 (Surr)	*92*		*75 - 120*	*04/17/23 13:15*	*04/23/23 20:08*	*50*
4-Bromofluorobenzene (Surr)	*102*		*72 - 124*	*04/17/23 13:15*	*04/23/23 20:08*	*50*
Dibromofluoromethane	*94*		*75 - 120*	*04/17/23 13:15*	*04/23/23 20:08*	*50*

Method: SW846 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	ND		0.041	0.0074	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Acenaphthylene	ND		0.041	0.0055	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Anthracene	ND		0.041	0.0069	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Benzo[a]anthracene	**0.011**	**J**	0.041	0.0056	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Benzo[a]pyrene	ND		0.041	0.0080	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Benzo[b]fluoranthene	ND		0.041	0.0089	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Benzo[g,h,i]perylene	ND		0.041	0.013	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Benzo[k]fluoranthene	ND		0.041	0.012	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Chrysene	ND		0.041	0.011	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Dibenz(a,h)anthracene	ND		0.041	0.0080	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Fluoranthene	ND		0.041	0.0077	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Indeno[1,2,3-cd]pyrene	ND		0.041	0.011	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Naphthalene	ND		0.041	0.0064	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Phenanthrene	ND		0.041	0.0058	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Pyrene	ND		0.041	0.0082	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1
Fluorene	ND		0.041	0.0058	mg/Kg	☼	04/25/23 08:39	04/27/23 00:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*58*		*37 - 147*	*04/25/23 08:39*	*04/27/23 00:47*	*1*
2-Fluorobiphenyl	*74*		*43 - 145*	*04/25/23 08:39*	*04/27/23 00:47*	*1*
Terphenyl-d14 (Surr)	*80*		*42 - 157*	*04/25/23 08:39*	*04/27/23 00:47*	*1*

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	**4.3**		0.54	0.25	mg/Kg	☼	04/21/23 09:24	04/25/23 22:38	1

Method: SW846 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	**0.018**	**J B**	0.050	0.0075	mg/L		04/20/23 16:28	04/24/23 21:52	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 9045D)	**7.3**		0.2	0.2	SU			04/19/23 17:20	1

Definitions/Glossary

Client: O'Brien & Associates
Job ID: 500-232430-1
Project/Site: Evanston Service Center North Fuel Island

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
F3	Duplicate RPD exceeds the control limit
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

GC/MS VOA

Prep Batch: 708429

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-232430-1	B-1 S-3	Total/NA	Solid	5035	
500-232430-2	B-2 S-4	Total/NA	Solid	5035	

Analysis Batch: 709149

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-232430-1	B-1 S-3	Total/NA	Solid	8260B	708429
500-232430-2	B-2 S-4	Total/NA	Solid	8260B	708429
MB 500-709149/7	Method Blank	Total/NA	Solid	8260B	
LCS 500-709149/5	Lab Control Sample	Total/NA	Solid	8260B	

GC/MS Semi VOA

Prep Batch: 709524

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-232430-1	B-1 S-3	Total/NA	Solid	3541	
500-232430-2	B-2 S-4	Total/NA	Solid	3541	
MB 500-709524/1-A	Method Blank	Total/NA	Solid	3541	
LCS 500-709524/2-A	Lab Control Sample	Total/NA	Solid	3541	

Analysis Batch: 709810

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 500-709524/1-A	Method Blank	Total/NA	Solid	8270D	709524
LCS 500-709524/2-A	Lab Control Sample	Total/NA	Solid	8270D	709524

Analysis Batch: 709815

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-232430-1	B-1 S-3	Total/NA	Solid	8270D	709524
500-232430-2	B-2 S-4	Total/NA	Solid	8270D	709524

Metals

Leach Batch: 708602

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-232430-1	B-1 S-3	TCLP	Solid	1311	
500-232430-2	B-2 S-4	TCLP	Solid	1311	
LB 500-708602/1-B	Method Blank	TCLP	Solid	1311	

Prep Batch: 708896

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-232430-1	B-1 S-3	TCLP	Solid	3010A	708602
500-232430-2	B-2 S-4	TCLP	Solid	3010A	708602
LB 500-708602/1-B	Method Blank	TCLP	Solid	3010A	708602
LCS 500-708896/2-A	Lab Control Sample	Total/NA	Solid	3010A	

Prep Batch: 708996

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-232430-1	B-1 S-3	Total/NA	Solid	3050B	
500-232430-2	B-2 S-4	Total/NA	Solid	3050B	
MB 500-708996/1-A	Method Blank	Total/NA	Solid	3050B	
LCS 500-708996/2-A	Lab Control Sample	Total/NA	Solid	3050B	
500-232430-1 MS	B-1 S-3	Total/NA	Solid	3050B	
500-232430-1 MSD	B-1 S-3	Total/NA	Solid	3050B	

Metals (Continued)

Prep Batch: 708996 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-232430-1 DU	B-1 S-3	Total/NA	Solid	3050B	

Analysis Batch: 709584

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-232430-1	B-1 S-3	TCLP	Solid	6010B	708896
500-232430-2	B-2 S-4	TCLP	Solid	6010B	708896
LB 500-708602/1-B	Method Blank	TCLP	Solid	6010B	708896
LCS 500-708896/2-A	Lab Control Sample	Total/NA	Solid	6010B	708896

Analysis Batch: 709843

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-232430-1	B-1 S-3	Total/NA	Solid	6010B	708996
500-232430-2	B-2 S-4	Total/NA	Solid	6010B	708996
MB 500-708996/1-A	Method Blank	Total/NA	Solid	6010B	708996
LCS 500-708996/2-A	Lab Control Sample	Total/NA	Solid	6010B	708996
500-232430-1 MS	B-1 S-3	Total/NA	Solid	6010B	708996
500-232430-1 MSD	B-1 S-3	Total/NA	Solid	6010B	708996
500-232430-1 DU	B-1 S-3	Total/NA	Solid	6010B	708996

General Chemistry

Analysis Batch: 708510

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-232430-1	B-1 S-3	Total/NA	Solid	Moisture	
500-232430-2	B-2 S-4	Total/NA	Solid	Moisture	

Analysis Batch: 708681

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-232430-1	B-1 S-3	Total/NA	Solid	9045D	
500-232430-2	B-2 S-4	Total/NA	Solid	9045D	
LCS 500-708681/2	Lab Control Sample	Total/NA	Solid	9045D	
LCSD 500-708681/3	Lab Control Sample Dup	Total/NA	Solid	9045D	

Surrogate Summary

Client: O'Brien & Associates
Job ID: 500-232430-1
Project/Site: Evanston Service Center North Fuel Island

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Solid **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
		DCA	TOL	BFB	DBFM
Lab Sample ID	Client Sample ID	(75-126)	(75-120)	(72-124)	(75-120)
500-232430-1	B-1 S-3	94	92	103	94
500-232430-2	B-2 S-4	94	92	102	94
LCS 500-709149/5	Lab Control Sample	92	94	103	95
MB 500-709149/7	Method Blank	96	92	104	95

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
TOL = Toluene-d8 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Solid **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)		
		NBZ	FBP	TPHL
Lab Sample ID	Client Sample ID	(37-147)	(43-145)	(42-157)
500-232430-1	B-1 S-3	68	83	95
500-232430-2	B-2 S-4	58	74	80
LCS 500-709524/2-A	Lab Control Sample	96	93	102
MB 500-709524/1-A	Method Blank	92	88	96

Surrogate Legend

NBZ = Nitrobenzene-d5 (Surr)
FBP = 2-Fluorobiphenyl
TPHL = Terphenyl-d14 (Surr)

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 500-709149/7
Matrix: Solid
Analysis Batch: 709149

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.00025	0.00015	mg/Kg			04/23/23 16:28	1
Toluene	ND		0.00025	0.00015	mg/Kg			04/23/23 16:28	1
Ethylbenzene	ND		0.00025	0.00018	mg/Kg			04/23/23 16:28	1
Xylenes, Total	ND		0.00050	0.00022	mg/Kg			04/23/23 16:28	1
Methyl tert-butyl ether	ND		0.0010	0.00039	mg/Kg			04/23/23 16:28	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*96*		*75 - 126*		*04/23/23 16:28*	*1*
Toluene-d8 (Surr)	*92*		*75 - 120*		*04/23/23 16:28*	*1*
4-Bromofluorobenzene (Surr)	*104*		*72 - 124*		*04/23/23 16:28*	*1*
Dibromofluoromethane	*95*		*75 - 120*		*04/23/23 16:28*	*1*

Lab Sample ID: LCS 500-709149/5
Matrix: Solid
Analysis Batch: 709149

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Benzene	0.0500	0.0516		mg/Kg		103	70 - 120
Toluene	0.0500	0.0520		mg/Kg		104	70 - 125
Ethylbenzene	0.0500	0.0498		mg/Kg		100	70 - 123
Xylenes, Total	0.100	0.101		mg/Kg		101	70 - 125
Methyl tert-butyl ether	0.0500	0.0520		mg/Kg		104	55 - 123

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*92*		*75 - 126*
Toluene-d8 (Surr)	*94*		*75 - 120*
4-Bromofluorobenzene (Surr)	*103*		*72 - 124*
Dibromofluoromethane	*95*		*75 - 120*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 500-709524/1-A
Matrix: Solid
Analysis Batch: 709810

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 709524

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	ND		0.033	0.0060	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Acenaphthylene	ND		0.033	0.0044	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Anthracene	ND		0.033	0.0056	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Benzo[a]anthracene	ND		0.033	0.0045	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Benzo[a]pyrene	ND		0.033	0.0064	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Benzo[b]fluoranthene	ND		0.033	0.0072	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Benzo[g,h,i]perylene	ND		0.033	0.011	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Benzo[k]fluoranthene	ND		0.033	0.0098	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Chrysene	ND		0.033	0.0091	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Dibenz(a,h)anthracene	ND		0.033	0.0064	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Fluoranthene	ND		0.033	0.0062	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Indeno[1,2,3-cd]pyrene	ND		0.033	0.0086	mg/Kg		04/25/23 08:39	04/26/23 14:58	1

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 500-709524/1-A
Matrix: Solid
Analysis Batch: 709810

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 709524

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	ND		0.033	0.0051	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Phenanthrene	ND		0.033	0.0046	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Pyrene	ND		0.033	0.0066	mg/Kg		04/25/23 08:39	04/26/23 14:58	1
Fluorene	ND		0.033	0.0047	mg/Kg		04/25/23 08:39	04/26/23 14:58	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*92*		*37 - 147*	*04/25/23 08:39*	*04/26/23 14:58*	*1*
2-Fluorobiphenyl	*88*		*43 - 145*	*04/25/23 08:39*	*04/26/23 14:58*	*1*
Terphenyl-d14 (Surr)	*96*		*42 - 157*	*04/25/23 08:39*	*04/26/23 14:58*	*1*

Lab Sample ID: LCS 500-709524/2-A
Matrix: Solid
Analysis Batch: 709810

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 709524

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Acenaphthene	3.33	2.97		mg/Kg		89	65 - 124
Acenaphthylene	3.33	3.34		mg/Kg		100	68 - 120
Anthracene	3.33	3.27		mg/Kg		98	70 - 114
Benzo[a]anthracene	3.33	3.21		mg/Kg		96	67 - 122
Benzo[a]pyrene	3.33	3.13		mg/Kg		94	65 - 133
Benzo[b]fluoranthene	3.33	3.09		mg/Kg		93	69 - 129
Benzo[g,h,i]perylene	3.33	3.66		mg/Kg		110	72 - 131
Benzo[k]fluoranthene	3.33	3.25		mg/Kg		98	68 - 127
Chrysene	3.33	3.19		mg/Kg		96	63 - 120
Dibenz(a,h)anthracene	3.33	3.18		mg/Kg		95	64 - 131
Fluoranthene	3.33	3.47		mg/Kg		104	62 - 120
Indeno[1,2,3-cd]pyrene	3.33	3.53		mg/Kg		106	68 - 130
Naphthalene	3.33	2.90		mg/Kg		87	63 - 110
Phenanthrene	3.33	3.12		mg/Kg		94	62 - 120
Pyrene	3.33	3.48		mg/Kg		104	61 - 128
Fluorene	3.33	2.90		mg/Kg		87	62 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Nitrobenzene-d5 (Surr)	*96*		*37 - 147*
2-Fluorobiphenyl	*93*		*43 - 145*
Terphenyl-d14 (Surr)	*102*		*42 - 157*

Method: 6010B - Metals (ICP)

Lab Sample ID: LCS 500-708896/2-A
Matrix: Solid
Analysis Batch: 709584

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 708896

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Lead	0.100	0.106		mg/L		106	80 - 120

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: MB 500-708996/1-A
Matrix: Solid
Analysis Batch: 709843

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 708996

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	ND		0.50	0.23	mg/Kg		04/21/23 09:24	04/25/23 22:06	1

Lab Sample ID: LCS 500-708996/2-A
Matrix: Solid
Analysis Batch: 709843

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 708996

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Lead	10.0	8.85		mg/Kg		88	80 - 120

Lab Sample ID: 500-232430-1 MS
Matrix: Solid
Analysis Batch: 709843

Client Sample ID: B-1 S-3
Prep Type: Total/NA
Prep Batch: 708996

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Lead	15		11.4	26.0		mg/Kg	☼	93	75 - 125

Lab Sample ID: 500-232430-1 MSD
Matrix: Solid
Analysis Batch: 709843

Client Sample ID: B-1 S-3
Prep Type: Total/NA
Prep Batch: 708996

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Lead	15		10.9	25.9		mg/Kg	☼	96	75 - 125	0	20

Lab Sample ID: 500-232430-1 DU
Matrix: Solid
Analysis Batch: 709843

Client Sample ID: B-1 S-3
Prep Type: Total/NA
Prep Batch: 708996

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Lead	15		19.2	F3	mg/Kg	☼	22	20

Lab Sample ID: LB 500-708602/1-B
Matrix: Solid
Analysis Batch: 709584

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 708896

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.00948	J	0.050	0.0075	mg/L		04/20/23 16:28	04/24/23 20:56	1

Lab Chronicle

Client: O'Brien & Associates
Job ID: 500-232430-1
Project/Site: Evanston Service Center North Fuel Island

Client Sample ID: B-1 S-3
Lab Sample ID: 500-232430-1
Date Collected: 04/17/23 10:20
Matrix: Solid
Date Received: 04/18/23 12:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
TCLP	Leach	1311			708602	LM	EET CHI	04/19/23 13:50 - 04/20/23 05:50 [1]
TCLP	Prep	3010A			708896	RN	EET CHI	04/20/23 16:28 - 04/20/23 16:58 [1]
TCLP	Analysis	6010B		1	709584	CMS	EET CHI	04/24/23 21:49
Total/NA	Analysis	9045D		1	708681	LWN	EET CHI	04/19/23 17:18
Total/NA	Analysis	Moisture		1	708510	LWN	EET CHI	04/19/23 10:27

Client Sample ID: B-1 S-3
Lab Sample ID: 500-232430-1
Date Collected: 04/17/23 10:20
Matrix: Solid
Date Received: 04/18/23 12:10
Percent Solids: 85.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	5035			708429	WRE	EET CHI	04/17/23 10:20
Total/NA	Analysis	8260B		50	709149	W1T	EET CHI	04/23/23 19:44
Total/NA	Prep	3541			709524	GM	EET CHI	04/25/23 08:39 - 04/25/23 14:10 [1]
Total/NA	Analysis	8270D		1	709815	SS	EET CHI	04/27/23 00:25
Total/NA	Prep	3050B			708996	BDE	EET CHI	04/21/23 09:24 - 04/21/23 09:54 [1]
Total/NA	Analysis	6010B		1	709843	CMS	EET CHI	04/25/23 22:13

Client Sample ID: B-2 S-4
Lab Sample ID: 500-232430-2
Date Collected: 04/17/23 13:15
Matrix: Solid
Date Received: 04/18/23 12:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
TCLP	Leach	1311			708602	LM	EET CHI	04/19/23 13:50 - 04/20/23 05:50 [1]
TCLP	Prep	3010A			708896	RN	EET CHI	04/20/23 16:28 - 04/20/23 16:58 [1]
TCLP	Analysis	6010B		1	709584	CMS	EET CHI	04/24/23 21:52
Total/NA	Analysis	9045D		1	708681	LWN	EET CHI	04/19/23 17:20
Total/NA	Analysis	Moisture		1	708510	LWN	EET CHI	04/19/23 10:27

Client Sample ID: B-2 S-4
Lab Sample ID: 500-232430-2
Date Collected: 04/17/23 13:15
Matrix: Solid
Date Received: 04/18/23 12:10
Percent Solids: 77.6

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	5035			708429	WRE	EET CHI	04/17/23 13:15
Total/NA	Analysis	8260B		50	709149	W1T	EET CHI	04/23/23 20:08
Total/NA	Prep	3541			709524	GM	EET CHI	04/25/23 08:39 - 04/25/23 14:10 [1]
Total/NA	Analysis	8270D		1	709815	SS	EET CHI	04/27/23 00:47
Total/NA	Prep	3050B			708996	BDE	EET CHI	04/21/23 09:24 - 04/21/23 09:54 [1]
Total/NA	Analysis	6010B		1	709843	CMS	EET CHI	04/25/23 22:38

[1] Completion dates and times are reported or not reported per method requirements or individual lab discretion.

Laboratory References:
EET CHI = Eurofins Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Accreditation/Certification Summary

Client: O'Brien & Associates
Job ID: 500-232430-1
Project/Site: Evanston Service Center North Fuel Island

Laboratory: Eurofins Chicago

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Illinois	NELAP	IL00035	04-29-23

Chain of Custody Record

Client Contact	Project Manager: Vernon Brown	Site Contact:	Date:	COC No
O'Brien & Associates, Inc.	mail: vernbrown@obainc.net	Lab Contact:	Carrier:	____ of ____ COCs
Address 766 W Algonquin Road	Analysis Turnaround Time			Job No 500-232430
City/State/Zip Arlington Heights, IL 60005	Calendar (C) or Work Days (W) ____			
(847) 398-1441 Phone	TAT if different from Below ____			SDG No
(847) 398-2376 FAX	[X] Standard			
Project Name Evanston Service Center North Fuel Island	[ ] 3 days			
Site 2100 Ridge Ave , Evanston IL	[ ] 2 days			
OBA Job # 23103	[ ] 1 day			

500-232430 COC

Sample Identification	Sample Date - 2023	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	BTEX-MTBE	pH	PNAs	Lead (Total)	Lead (TCLP)	Hold	Sample Specific Notes
B-1 S-3	4/17	10.20	Grab	Soil	3		X	X	X	X	X	X	All Samples for Clean Construction Demolition Debris (CCDD) Certification
B-2 S-4	↑	↑	↑	↑	↑		X	X	X	X	X	X	
							6			1			

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= 5035 & Ice; 7=Other____

Possible Hazard Identification

[ ] Non-Hazard [ ] Flammable [ ] Skin Irritant Poison B [ ] Unknown [X]

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

[ ] Return To Client [X] Disposal By Lab [ ] Archive For ____ Months

Special Instructions/QC Requirements & Comments: ***pending results, additional testing may be requested**

5c7 → 5c4
~~5c4 → 5c8~~ sc 4/19/23

Relinquished by	Company	Date/Time	Received by	Company	Date/Time
[signature]	O'Brien & Associates, Inc	4/18/23 8:56	[signature]	EEA	4/18/23 8:52
[signature]	BKWC	4/18/23	[signature]	EEA	4/18 0800
[signature]	EEA 4/18	1210	[signature]	EEA	4/18/23 1210

Login Sample Receipt Checklist

Client: O'Brien & Associates

Job Number: 500-232430-1

Login Number: 232430
List Number: 1
Creator: Scott, Sherri L

List Source: Eurofins Chicago

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	5.6
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Cook County Prevailing Wage Rates posted on 5/22/2023

						Overtime								
Trade Title	**Rg**	**Type**	**C**	**Base**	**Foreman**	**M-F**	**Sa**	**Su**	**Hol**	**H/W**	**Pension**	**Vac**	**Trng**	**Other Ins**
ASBESTOS ABT-GEN	All	ALL		47.40	48.40	1.5	1.5	2.0	2.0	17.05	15.21	0.00	0.90	
ASBESTOS ABT-MEC	All	BLD		39.60	42.77	1.5	1.5	2.0	2.0	14.77	13.59	0.00	0.86	
BOILERMAKER	All	BLD		54.71	59.63	2.0	2.0	2.0	2.0	6.97	25.06	0.00	2.83	
BRICK MASON	All	BLD		49.81	54.79	1.5	1.5	2.0	2.0	12.10	21.56	0.00	1.10	
CARPENTER	All	ALL		52.01	54.01	1.5	1.5	2.0	2.0	11.79	24.76	1.50	0.80	
CEMENT MASON	All	ALL		49.75	51.75	2.0	1.5	2.0	2.0	17.08	20.74	0.00	1.00	
CERAMIC TILE FINISHER	All	BLD		44.18	44.18	1.5	1.5	2.0	2.0	12.25	14.77	0.00	1.00	
CERAMIC TILE LAYER	All	BLD		51.44	55.44	1.5	1.5	2.0	2.0	12.25	18.48	0.00	1.08	
COMMUNICATION ELECTRICIAN	All	BLD		47.16	50.46	1.5	1.5	2.0	2.0	12.70	14.10	1.25	1.57	0.50
ELECTRIC PWR EQMT OP	All	ALL		58.25	63.91	1.5	1.5	2.0	2.0	13.08	19.67	0.00	3.19	
ELECTRIC PWR GRNDMAN	All	ALL		45.44	63.91	1.5	1.5	2.0	2.0	10.20	15.34	0.00	2.49	
ELECTRIC PWR LINEMAN	All	ALL		58.25	63.91	1.5	1.5	2.0	2.0	13.08	19.67	0.00	3.19	
ELECTRICIAN	All	ALL		52.05	55.69	1.5	1.5	2.0	2.0	17.65	18.30	1.25	1.92	1.50
ELEVATOR CONSTRUCTOR	All	BLD		62.47	70.28	2.0	2.0	2.0	2.0	16.03	20.21	5.00	0.65	
FENCE ERECTOR	All	ALL		46.89	48.89	1.5	1.5	2.0	2.0	13.68	17.42	0.00	0.75	
GLAZIER	All	BLD		48.75	50.25	1.5	2.0	2.0	2.0	15.19	24.43	0.00	1.70	
HEAT/FROST INSULATOR	All	BLD		52.80	55.97	1.5	1.5	2.0	2.0	14.77	16.76	0.00	0.86	
IRON WORKER	All	ALL		55.81	57.81	2.0	2.0	2.0	2.0	16.05	25.31	0.00	0.49	
LABORER	All	ALL		47.40	48.15	1.5	1.5	2.0	2.0	17.05	15.21	0.00	0.90	
LATHER	All	ALL		52.01	54.01	1.5	1.5	2.0	2.0	11.79	24.76	1.50	0.80	
MACHINIST	All	BLD		53.18	57.18	1.5	1.5	2.0	2.0	9.93	8.95	1.85	1.47	
MARBLE FINISHER	All	ALL		38.00	51.41	1.5	1.5	2.0	2.0	12.10	19.60	0.00	0.60	
MARBLE SETTER	All	BLD		48.96	53.86	1.5	1.5	2.0	2.0	12.10	21.03	0.00	0.78	
MATERIAL TESTER I	All	ALL		37.40		1.5	1.5	2.0	2.0	17.05	15.21	0.00	0.90	
MATERIALS TESTER II	All	ALL		42.40		1.5	1.5	2.0	2.0	17.05	15.21	0.00	0.90	
MILLWRIGHT	All	ALL		52.01	54.01	1.5	1.5	2.0	2.0	11.79	24.76	1.50	0.80	
OPERATING ENGINEER	All	BLD	1	55.10	59.10	2.0	2.0	2.0	2.0	22.15	19.30	2.00	2.55	
OPERATING ENGINEER	All	BLD	2	53.80	59.10	2.0	2.0	2.0	2.0	22.15	19.30	2.00	2.55	
OPERATING ENGINEER	All	BLD	3	51.25	59.10	2.0	2.0	2.0	2.0	22.15	19.30	2.00	2.55	
OPERATING ENGINEER	All	BLD	4	49.50	59.10	2.0	2.0	2.0	2.0	22.15	19.30	2.00	2.55	
OPERATING ENGINEER	All	BLD	5	58.85	59.10	2.0	2.0	2.0	2.0	22.15	19.30	2.00	2.55	

OPERATING ENGINEER	All	BLD	6	56.10	59.10	2.0	2.0	2.0	2.0	22.15	19.30	2.00	2.55	
OPERATING ENGINEER	All	BLD	7	58.10	59.10	2.0	2.0	2.0	2.0	22.15	19.30	2.00	2.55	
OPERATING ENGINEER	All	FLT	1	61.10	61.10	1.5	1.5	2.0	2.0	21.40	18.60	2.00	2.40	
OPERATING ENGINEER	All	FLT	2	59.60	61.10	1.5	1.5	2.0	2.0	21.40	18.60	2.00	2.40	
OPERATING ENGINEER	All	FLT	3	58.10	61.10	1.5	1.5	2.0	2.0	21.40	18.60	2.00	2.40	
OPERATING ENGINEER	All	FLT	4	53.60	61.10	1.5	1.5	2.0	2.0	21.40	18.60	2.00	2.40	
OPERATING ENGINEER	All	FLT	5	62.60	61.10	1.5	1.5	2.0	2.0	21.40	18.60	2.00	2.40	
OPERATING ENGINEER	All	FLT	6	41.00	61.10	1.5	1.5	2.0	2.0	21.40	18.60	2.00	2.40	
OPERATING ENGINEER	All	HWY	1	53.30	57.30	1.5	1.5	2.0	2.0	22.15	19.30	2.00	2.55	
OPERATING ENGINEER	All	HWY	2	52.75	57.30	1.5	1.5	2.0	2.0	22.15	19.30	2.00	2.55	
OPERATING ENGINEER	All	HWY	3	50.70	57.30	1.5	1.5	2.0	2.0	22.15	19.30	2.00	2.55	
OPERATING ENGINEER	All	HWY	4	49.30	57.30	1.5	1.5	2.0	2.0	22.15	19.30	2.00	2.55	
OPERATING ENGINEER	All	HWY	5	48.10	57.30	1.5	1.5	2.0	2.0	22.15	19.30	2.00	2.55	
OPERATING ENGINEER	All	HWY	6	56.30	57.30	1.5	1.5	2.0	2.0	22.15	19.30	2.00	2.55	
OPERATING ENGINEER	All	HWY	7	54.30	57.30	1.5	1.5	2.0	2.0	22.15	19.30	2.00	2.55	
ORNAMENTAL IRON WORKER	All	ALL		53.32	55.82	2.0	2.0	2.0	2.0	14.23	25.00	0.00	1.75	
PAINTER	All	ALL		50.30	56.59	1.5	1.5	1.5	2.0	14.26	14.99	0.00	1.72	
PAINTER - SIGNS	All	BLD		41.55	46.67	1.5	1.5	2.0	2.0	3.04	3.90	0.00	0.00	
PILEDRIVER	All	ALL		52.01	54.01	1.5	1.5	2.0	2.0	11.79	24.76	1.50	0.80	
PIPEFITTER	All	BLD		53.00	56.00	1.5	1.5	2.0	2.0	11.85	22.85	0.00	2.92	
PLASTERER	All	BLD		47.75	50.62	1.5	1.5	2.0	2.0	17.08	19.18	0.00	1.00	
PLUMBER	All	BLD		54.80	58.10	1.5	1.5	2.0	2.0	16.70	17.04	0.00	1.58	
ROOFER	All	BLD		48.00	53.00	1.5	1.5	2.0	2.0	11.83	15.26	0.00	0.99	
SHEETMETAL WORKER	All	BLD		49.10	53.03	1.5	1.5	2.0	2.0	13.53	28.20	0.00	1.00	
SIGN HANGER	All	BLD		34.72	37.50	1.5	1.5	2.0	2.0	6.85	4.50	0.00	0.00	
SPRINKLER FITTER	All	BLD		54.55	57.30	1.5	1.5	2.0	2.0	14.20	18.70	0.00	0.75	
STEEL ERECTOR	All	ALL		55.81	57.81	2.0	2.0	2.0	2.0	16.05	25.31	0.00	0.49	
STONE MASON	All	BLD		49.81	54.79	1.5	1.5	2.0	2.0	12.10	21.56	0.00	1.10	
TERRAZZO FINISHER	All	BLD		45.57	45.57	1.5	1.5	2.0	2.0	12.25	17.14	0.00	1.03	
TERRAZZO MECHANIC	All	BLD		49.41	52.91	1.5	1.5	2.0	2.0	12.25	18.60	0.00	1.07	
TRAFFIC SAFETY WORKER I	All	HWY		39.30	40.90	1.5	1.5	2.0	2.0	9.65	9.10	0.00	0.10	
TRAFFIC SAFETY WORKER II	ALL	HWY		40.30	41.90	1.5	1.5	2.0	2.0	9.65	9.10	0.00	0.10	
TRUCK DRIVER	E	ALL	1	39.95	40.60	1.5	1.5	2.0	2.0	12.30	15.24	0.00	0.15	
TRUCK DRIVER	E	ALL	2	40.20	40.60	1.5	1.5	2.0	2.0	12.30	15.24	0.00	0.15	
TRUCK DRIVER	E	ALL	3	40.40	40.60	1.5	1.5	2.0	2.0	12.30	15.24	0.00	0.15	
TRUCK DRIVER	E	ALL	4	40.60	40.60	1.5	1.5	2.0	2.0	12.30	15.24	0.00	0.15	

TRUCK DRIVER	W	ALL	1	40.63	41.18	1.5	1.5	2.0	2.0	10.70	14.71	0.00	0.15	
TRUCK DRIVER	W	ALL	2	40.78	41.18	1.5	1.5	2.0	2.0	10.70	14.71	0.00	0.15	
TRUCK DRIVER	W	ALL	3	40.98	41.18	1.5	1.5	2.0	2.0	10.70	14.71	0.00	0.15	
TRUCK DRIVER	W	ALL	4	41.18	41.18	1.5	1.5	2.0	2.0	10.70	14.71	0.00	0.15	
TUCKPOINTER	All	BLD		49.53	50.53	1.5	1.5	2.0	2.0	9.04	21.06	0.00	1.07	

Legend
Rg Region
Type Trade Type - All,Highway,Building,Floating,Oil & Chip,Rivers
C Class
Base Base Wage Rate
OT M-F Unless otherwise noted, OT pay is required for any hour greater than 8 worked each day, Mon through Fri. The number listed is the multiple of the base wage.
OT Sa Overtime pay required for every hour worked on Saturdays
OT Su Overtime pay required for every hour worked on Sundays
OT Hol Overtime pay required for every hour worked on Holidays
H/W Health/Welfare benefit
Vac Vacation
Trng Training
Other Ins Employer hourly cost for any other type(s) of insurance provided for benefit of worker.

Explanations COOK COUNTY

The following list is considered as those days for which holiday rates of wages for work performed apply: New Years Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Christmas Day and Veterans Day in some classifications/counties. Generally, any of these holidays which fall on a Sunday is celebrated on the following Monday. This then makes work performed on that Monday payable at the appropriate overtime rate for holiday pay. Common practice in a given local may alter certain days of celebration. If in doubt, please check with IDOL.

TRUCK DRIVERS (WEST) - That part of the county West of Barrington Road.

EXPLANATION OF CLASSES

ASBESTOS - GENERAL - removal of asbestos material/mold and hazardous materials from any place in a building, including mechanical systems where those mechanical systems are to be removed. This includes the removal of asbestos materials/mold and hazardous materials from ductwork or pipes in a building when the building is to be demolished at the time or at some close future date. ASBESTOS - MECHANICAL - removal of asbestos material from mechanical systems, such as pipes, ducts, and boilers, where the mechanical systems are to remain.

CERAMIC TILE FINISHER

The grouting, cleaning, and polishing of all classes of tile, whether for interior or exterior purposes, all burned, glazed or unglazed products; all composition materials, granite tiles, warning detectable tiles, cement tiles, epoxy composite materials, pavers, glass, mosaics, fiberglass, and all substitute materials, for tile made in tile-like units; all mixtures in tile like form of cement, metals, and other materials that are for and intended for use as a finished floor surface, stair treads, promenade roofs, walks, walls, ceilings, swimming pools, and all other places where tile is to form a finished interior or exterior. The mixing of all setting mortars including but not limited to thin-set mortars, epoxies, wall mud, and any other sand and cement mixtures or adhesives when

used in the preparation, installation, repair, or maintenance of tile and/or similar materials. The handling and unloading of all sand, cement, lime, tile, fixtures, equipment, adhesives, or any other materials to be used in the preparation, installation, repair, or maintenance of tile and/or similar materials. Ceramic Tile Finishers shall fill all joints and voids regardless of method on all tile work, particularly and especially after installation of said tile work. Application of any and all protective coverings to all types of tile installations including, but not be limited to, all soap compounds, paper products, tapes, and all polyethylene coverings, plywood, masonite, cardboard, and any new type of products that may be used to protect tile installations, Blastrac equipment, and all floor scarifying equipment used in preparing floors to receive tile. The clean up and removal of all waste and materials. All demolition of existing tile floors and walls to be re-tiled.

COMMUNICATIONS ELECTRICIAN

Installation, operation, inspection, maintenance, repair and service of radio, television, recording, voice sound vision production and reproduction, telephone and telephone interconnect, facsimile, data apparatus, coaxial, fibre optic and wireless equipment, appliances and systems used for the transmission and reception of signals of any nature, business, domestic, commercial, education, entertainment, and residential purposes, including but not limited to, communication and telephone, electronic and sound equipment, fibre optic and data communication systems, and the performance of any task directly related to such installation or service whether at new or existing sites, such tasks to include the placing of wire and cable and electrical power conduit or other raceway work within the equipment room and pulling wire and/or cable through conduit and the installation of any incidental conduit, such that the employees covered hereby can complete any job in full.

MARBLE FINISHER

Loading and unloading trucks, distribution of all materials (all stone, sand, etc.), stocking of floors with material, performing all rigging for heavy work, the handling of all material that may be needed for the installation of such materials, building of scaffolding, polishing if needed, patching, waxing of material if damaged, pointing up, caulking, grouting and cleaning of marble, holding water on diamond or Carborundum blade or saw for setters cutting, use of tub saw or any other saw needed for preparation of material, drilling of holes for wires that anchor material set by setters, mixing up of molding plaster for installation of material, mixing up thin set for the installation of material, mixing up of sand to cement for the installation of material and such other work as may be required in helping a Marble Setter in the handling of all material in the erection or installation of interior marble, slate, travertine, art marble, serpentine, alberene stone, blue stone, granite and other stones (meaning as to stone any foreign or domestic materials as are specified and used in building interiors and exteriors and customarily known as stone in the trade), carrara, sanionyx, vitrolite and similar opaque glass and the laying of all marble tile, terrazzo tile, slate tile and precast tile, steps, risers treads, base, or any other materials that may be used as substitutes for any of the aforementioned materials and which are used on interior and exterior which are installed in a similar manner.

MATERIAL TESTER I: Hand coring and drilling for testing of materials; field inspection of uncured concrete and asphalt.

MATERIAL TESTER II: Field inspection of welds, structural steel, fireproofing, masonry, soil, facade, reinforcing steel, formwork, cured concrete, and concrete and asphalt batch plants; adjusting proportions of bituminous mixtures.

OPERATING ENGINEER - BUILDING

Class 1. Asphalt Plant; Asphalt Spreader; Autograde; Backhoes with Caisson Attachment; Batch Plant; Benoto (requires Two Engineers); Boiler and Throttle Valve; Caisson Rigs; Central Redi-Mix Plant; Combination Back Hoe Front End-loader Machine; Compressor and Throttle Valve; Concrete Breaker (Truck Mounted); Concrete Conveyor; Concrete Conveyor (Truck Mounted); Concrete Paver Over 27E cu. ft; Concrete Paver 27E cu. ft. and Under: Concrete Placer; Concrete Placing Boom; Concrete Pump (Truck Mounted); Concrete Tower; Cranes, All; Cranes, Hammerhead; Cranes, (GCI and similar Type); Creter Crane; Spider Crane; Crusher, Stone, etc.; Derricks, All; Derricks, Traveling; Formless Curb and Gutter Machine; Grader, Elevating; Grouting Machines; Heavy Duty Self-Propelled Transporter or Prime Mover; Highlift Shovels or Front Endloader 2-1/4 yd. and over; Hoists, Elevators, outside type rack and pinion and similar machines; Hoists, One, Two and Three Drum; Hoists, Two Tugger One Floor; Hydraulic

Backhoes; Hydraulic Boom Trucks; Hydro Vac (and similar equipment); Locomotives, All; Motor Patrol; Lubrication Technician; Manipulators; Pile Drivers and Skid Rig; Post Hole Digger; Pre-Stress Machine; Pump Cretes Dual Ram; Pump Cretes: Squeeze Cretes-Screw Type Pumps; Gypsum Bulker and Pump; Raised and Blind Hole Drill; Roto Mill Grinder; Scoops - Tractor Drawn; Slip-Form Paver; Straddle Buggies; Operation of Tie Back Machine; Tournapull; Tractor with Boom and Side Boom; Trenching Machines.

Class 2. Boilers; Broom, All Power Propelled; Bulldozers; Concrete Mixer (Two Bag and Over); Conveyor, Portable; Forklift Trucks; Highlift Shovels or Front Endloaders under 2-1/4 yd.; Hoists, Automatic; Hoists, Inside Elevators; Hoists, Sewer Dragging Machine; Hoists, Tugger Single Drum; Laser Screed; Rock Drill (Self-Propelled); Rock Drill (Truck Mounted); Rollers, All; Steam Generators; Tractors, All; Tractor Drawn Vibratory Roller; Winch Trucks with "A" Frame.

Class 3. Air Compressor; Combination Small Equipment Operator; Generators; Heaters, Mechanical; Hoists, Inside Elevators (remodeling or renovation work); Hydraulic Power Units (Pile Driving, Extracting, and Drilling); Pumps, over 3" (1 to 3 not to exceed a total of 300 ft.); Low Boys; Pumps, Well Points; Welding Machines (2 through 5); Winches, 4 Small Electric Drill Winches.

Class 4. Bobcats and/or other Skid Steer Loaders; Oilers; and Brick Forklift.

Class 5. Assistant Craft Foreman.

Class 6. Gradall.

Class 7. Mechanics; Welders.

OPERATING ENGINEERS - HIGHWAY CONSTRUCTION

Class 1. Asphalt Plant; Asphalt Heater and Planer Combination; Asphalt Heater Scarfire; Asphalt Spreader; Autograder/GOMACO or other similar type machines: ABG Paver; Backhoes with Caisson Attachment; Ballast Regulator; Belt Loader; Caisson Rigs; Car Dumper; Central Redi-Mix Plant; Combination Backhoe Front Endloader Machine, (1 cu. yd. Backhoe Bucket or over or with attachments); Concrete Breaker (Truck Mounted); Concrete Conveyor; Concrete Paver over 27E cu. ft.; Concrete Placer; Concrete Tube Float; Cranes, all attachments; Cranes, Tower Cranes of all types: Creter Crane: Spider Crane; Crusher, Stone, etc.; Derricks, All; Derrick Boats; Derricks, Traveling; Dredges; Elevators, Outside type Rack & Pinion and Similar Machines; Formless Curb and Gutter Machine; Grader, Elevating; Grader, Motor Grader, Motor Patrol, Auto Patrol, Form Grader, Pull Grader, Subgrader; Guard Rail Post Driver Truck Mounted; Hoists, One, Two and Three Drum; Heavy Duty Self-Propelled Transporter or Prime Mover; Hydraulic Backhoes; Backhoes with shear attachments up to 40' of boom reach; Lubrication Technician; Manipulators; Mucking Machine; Pile Drivers and Skid Rig; Pre-Stress Machine; Pump Cretes Dual Ram; Rock Drill - Crawler or Skid Rig; Rock Drill - Truck Mounted; Rock/Track Tamper; Roto Mill Grinder; Slip-Form Paver; Snow Melters; Soil Test Drill Rig (Truck Mounted); Straddle Buggies; Hydraulic Telescoping Form (Tunnel); Operation of Tieback Machine; Tractor Drawn Belt Loader; Tractor Drawn Belt Loader (with attached pusher - two engineers); Tractor with Boom; Tractaire with Attachments; Traffic Barrier Transfer Machine; Trenching; Truck Mounted Concrete Pump with Boom; Raised or Blind Hole Drills (Tunnel Shaft); Underground Boring and/or Mining Machines 5 ft. in diameter and over tunnel, etc; Underground Boring and/or Mining Machines under 5 ft. in diameter; Wheel Excavator; Widener (APSCO).

Class 2. Batch Plant; Bituminous Mixer; Boiler and Throttle Valve; Bulldozers; Car Loader Trailing Conveyors; Combination Backhoe Front Endloader Machine (Less than 1 cu. yd. Backhoe Bucket or over or with attachments); Compressor and Throttle Valve; Compressor, Common Receiver (3); Concrete Breaker or Hydro Hammer; Concrete Grinding Machine; Concrete Mixer or Paver 7S Series to and including 27 cu. ft.; Concrete Spreader; Concrete Curing Machine, Burlap Machine, Belting Machine and Sealing Machine; Concrete Wheel Saw; Conveyor Muck Cars (Haglund or Similar Type); Drills, All; Finishing Machine - Concrete; Highlift Shovels or Front Endloader; Hoist - Sewer Dragging Machine; Hydraulic Boom Trucks (All Attachments); Hydro-Blaster; Hydro Excavating (excluding hose work); Laser Screed; All Locomotives, Dinky; Off-Road Hauling Units (including articulating) Non Self-Loading Ejection Dump; Pump Cretes: Squeeze Cretes - Screw Type Pumps, Gypsum Bulker and Pump; Roller, Asphalt; Rotary

Snow Plows; Rototiller, Seaman, etc., self-propelled; Self-Propelled Compactor; Spreader - Chip - Stone, etc.; Scraper - Single/Twin Engine/Push and Pull; Scraper - Prime Mover in Tandem (Regardless of Size); Tractors pulling attachments, Sheeps Foot, Disc, Compactor, etc.; Tug Boats.

Class 3. Boilers; Brooms, All Power Propelled; Cement Supply Tender; Compressor, Common Receiver (2); Concrete Mixer (Two Bag and Over); Conveyor, Portable; Farm-Type Tractors Used for Mowing, Seeding, etc.; Forklift Trucks; Grouting Machine; Hoists, Automatic; Hoists, All Elevators; Hoists, Tugger Single Drum; Jeep Diggers; Low Boys; Pipe Jacking Machines; Post-Hole Digger; Power Saw, Concrete Power Driven; Pug Mills; Rollers, other than Asphalt; Seed and Straw Blower; Steam Generators; Stump Machine; Winch Trucks with "A" Frame; Work Boats; Tamper-Form-Motor Driven.

Class 4. Air Compressor; Combination - Small Equipment Operator; Directional Boring Machine; Generators; Heaters, Mechanical; Hydraulic Power Unit (Pile Driving, Extracting, or Drilling); Light Plants, All (1 through 5); Pumps, over 3" (1 to 3 not to exceed a total of 300 ft.); Pumps, Well Points; Vacuum Trucks (excluding hose work); Welding Machines (2 through 5); Winches, 4 Small Electric Drill Winches.

Class 5. SkidSteer Loader (all); Brick Forklifts; Oilers.

Class 6. Field Mechanics and Field Welders

Class 7. Dowell Machine with Air Compressor; Gradall and machines of like nature.

OPERATING ENGINEER - FLOATING

Class 1. Craft Foreman; Master Mechanic; Diver/Wet Tender; Engineer; Engineer (Hydraulic Dredge).

Class 2. Crane/Backhoe Operator; Boat Operator with towing endorsement; Mechanic/Welder; Assistant Engineer (Hydraulic Dredge); Leverman (Hydraulic Dredge); Diver Tender.

Class 3. Deck Equipment Operator, Machineryman, Maintenance of Crane (over 50 ton capacity) or Backhoe (115,000 lbs. or more); Tug/Launch Operator; Loader/Dozer and like equipment on Barge, Breakwater Wall, Slip/Dock, or Scow, Deck Machinery, etc.

Class 4. Deck Equipment Operator, Machineryman/Fireman (4 Equipment Units or More); Off Road Trucks; Deck Hand, Tug Engineer, Crane Maintenance (50 Ton Capacity and Under) or Backhoe Weighing (115,000 pounds or less); Assistant Tug Operator.

Class 5. Friction or Lattice Boom Cranes.

Class 6. ROV Pilot, ROV Tender

TERRAZZO FINISHER

The handling of sand, cement, marble chips, and all other materials that may be used by the Mosaic Terrazzo Mechanic, and the mixing, grinding, grouting, cleaning and sealing of all Marble, Mosaic, and Terrazzo work, floors, base, stairs, and wainscoting by hand or machine, and in addition, assisting and aiding Marble, Masonic, and Terrazzo Mechanics.

TRAFFIC SAFETY Worker I

Traffic Safety Worker I - work associated with the delivery, installation, pick-up and servicing of safety devices during periods of roadway construction, including such work as set-up and maintenance of barricades, barrier wall reflectors, drums, cones, delineators, signs, crash attenuators, glare screen and other such items, and the layout and application or removal of conflicting and/or temporary roadway markings utilized to control traffic in construction zones, as well as flagging for these operations.

TRAFFIC SAFETY WORKER II

Work associated with the installation and removal of permanent pavement markings and/or pavement markers including both installations performed by hand and installations performed by truck.

TRUCK DRIVER - BUILDING, HEAVY AND HIGHWAY CONSTRUCTION - EAST & WEST

Class 1. Two or three Axle Trucks. A-frame Truck when used for transportation purposes; Air Compressors and Welding Machines, including those pulled by cars, pick-up trucks and tractors; Ambulances; Batch Gate Lockers; Batch Hopperman; Car and Truck Washers; Carry-alls; Fork Lifts and Hoisters; Helpers; Mechanics Helpers and Greasers; Oil Distributors 2-man operation; Pavement Breakers; Pole Trailer, up to 40 feet; Power Mower Tractors; Self-propelled Chip Spreader; Skipman; Slurry Trucks, 2-man operation; Slurry Truck Conveyor Operation, 2 or 3 man; Teamsters; Unskilled Dumpman; and Truck Drivers hauling warning lights, barricades, and portable toilets on the job site.

Class 2. Four axle trucks; Dump Crets and Adgetors under 7 yards; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnapulls or Turnatrailers when pulling other than self-loading equipment or similar equipment under 16 cubic yards; Mixer Trucks under 7 yards; Ready-mix Plant Hopper Operator, and Winch Trucks, 2 Axles.

Class 3. Five axle trucks; Dump Crets and Adgetors 7 yards and over; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnatrailers or turnapulls when pulling other than self-loading equipment or similar equipment over 16 cubic yards; Explosives and/or Fission Material Trucks; Mixer Trucks 7 yards or over; Mobile Cranes while in transit; Oil Distributors, 1-man operation; Pole Trailer, over 40 feet; Pole and Expandable Trailers hauling material over 50 feet long; Slurry trucks, 1-man operation; Winch trucks, 3 axles or more; Mechanic--Truck Welder and Truck Painter.

Class 4. Six axle trucks; Dual-purpose vehicles, such as mounted crane trucks with hoist and accessories; Foreman; Master Mechanic; Self-loading equipment like P.B. and trucks with scoops on the front.

Other Classifications of Work:

For definitions of classifications not otherwise set out, the Department generally has on file such definitions which are available. If a task to be performed is not subject to one of the classifications of pay set out, the Department will upon being contacted state which neighboring county has such a classification and provide such rate, such rate being deemed to exist by reference in this document. If no neighboring county rate applies to the task, the Department shall undertake a special determination, such special determination being then deemed to have existed under this determination. If a project requires these, or any classification not listed, please contact IDOL at 217-782-1710 for wage rates or clarifications.

LANDSCAPING

Landscaping work falls under the existing classifications for laborer, operating engineer and truck driver. The work performed by landscape plantsman and landscape laborer is covered by the existing classification of laborer. The work performed by landscape operators (regardless of equipment used or its size) is covered by the classifications of operating engineer. The work performed by landscape truck drivers (regardless of size of truck driven) is covered by the classifications of truck driver.

MATERIAL TESTER & MATERIAL TESTER/INSPECTOR I AND II

Notwithstanding the difference in the classification title, the classification entitled "Material Tester I" involves the same job duties as the classification entitled "Material Tester/Inspector I". Likewise, the classification entitled "Material Tester II" involves the same job duties as the classification entitled "Material Tester/Inspector II".

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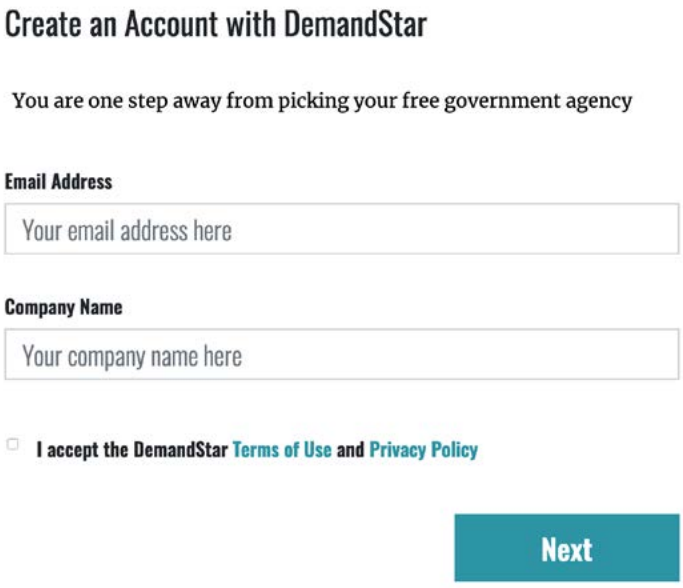

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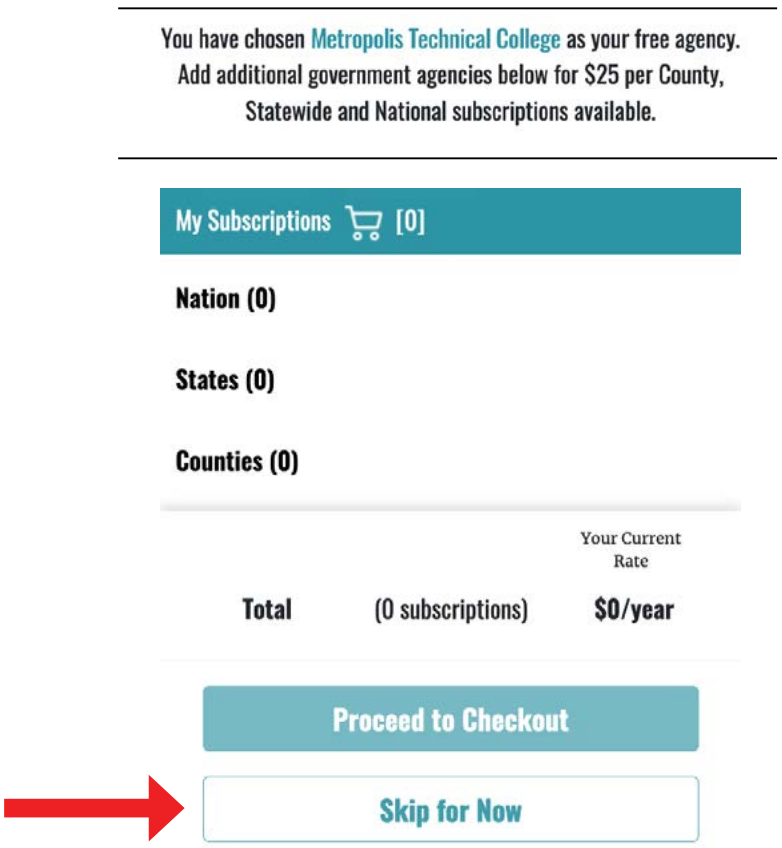
3 CHECK OUT

Check out with your **FREE AGENCY** Registration by clicking "Skip for now" on the page where it gives you options to add additional counties and States



SIGN UP

Visit www.demandstar.com

206.940.0305

DEMANDSTAR

Building Communities.

(E-bidding) Electronic Bidding Instructions

Introduction

To submit a bid electronically (e-bidding) on DemandStar

- The project **MUST** be setup for e-bidding by the government agency advertising the opportunity

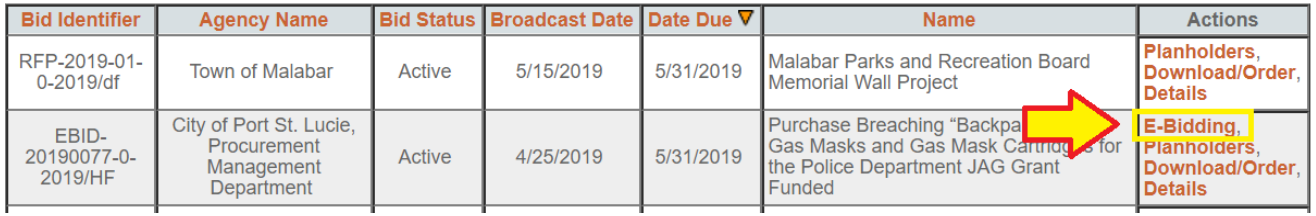
Bid Identifier	Agency Name	Bid Status	Broadcast Date	Date Due	Name	Actions
RFP-2019-01-0-2019/df	Town of Malabar	Active	5/15/2019	5/31/2019	Malabar Parks and Recreation Board Memorial Wall Project	Planholders, Download/Order, Details
EBID-20190077-0-2019/HF	City of Port St. Lucie, Procurement Management Department	Active	4/25/2019	5/31/2019	Purchase Breaching "Backpa... Gas Masks and Gas Mask Cartridg...s for the Police Department JAG Grant Funded	E-Bidding, Planholders, Download/Order, Details

How to check if it is an e-bidding opportunity

- Not all opportunities posted on DemandStar by government are available for e-bidding
- Those that are available for you to electronically bid will list "e-bidding" as an available "ACTION" when you look at the project details

In order to do e-bidding

1. Click on “E-bidding” in the actions column



Bid Identifier	Agency Name	Bid Status	Broadcast Date	Date Due	Name	Actions
RFP-2019-01-0-2019/df	Town of Malabar	Active	5/15/2019	5/31/2019	Malabar Parks and Recreation Board Memorial Wall Project	Planholders, Download/Order, Details
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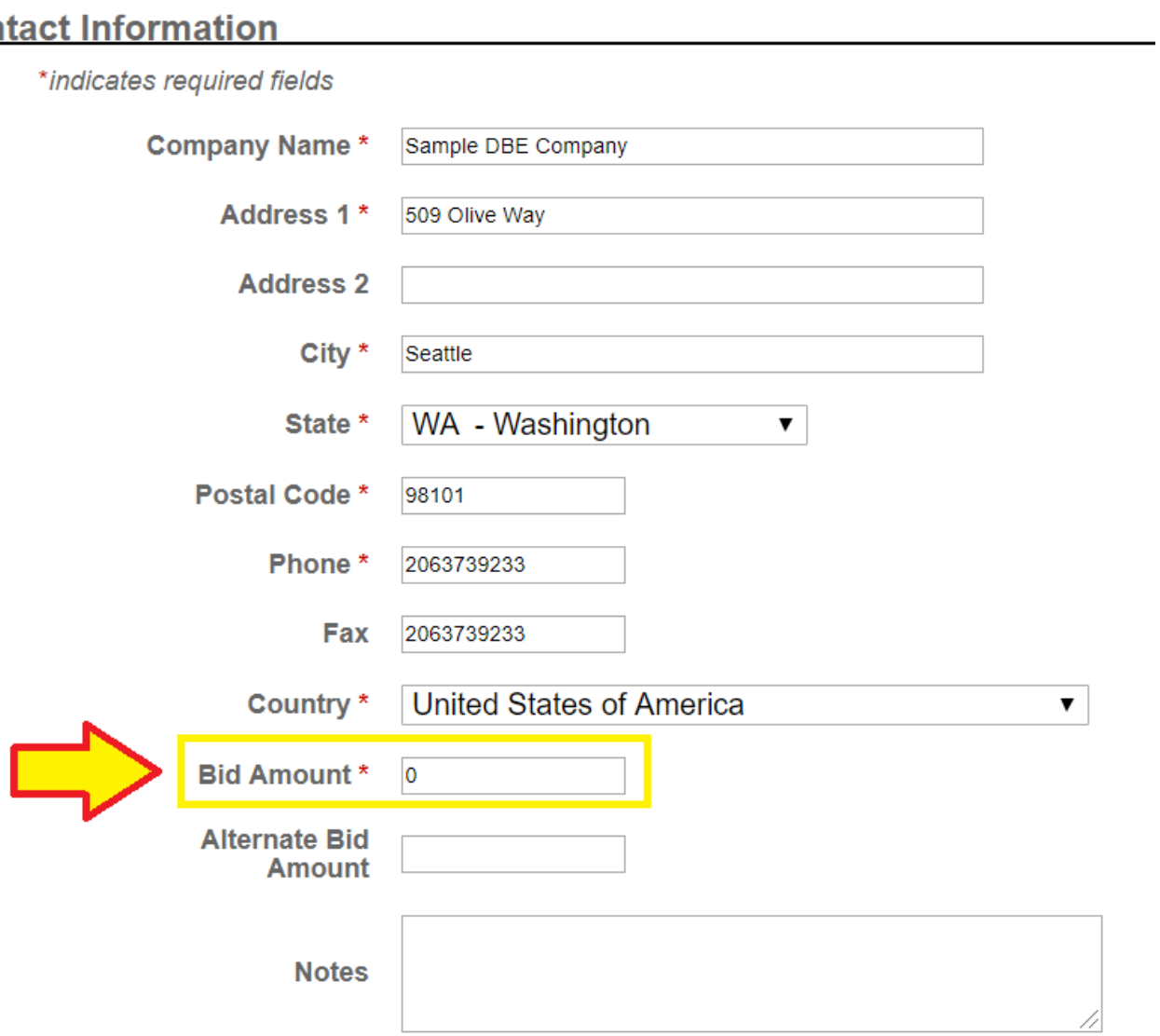
In order to do e-bidding

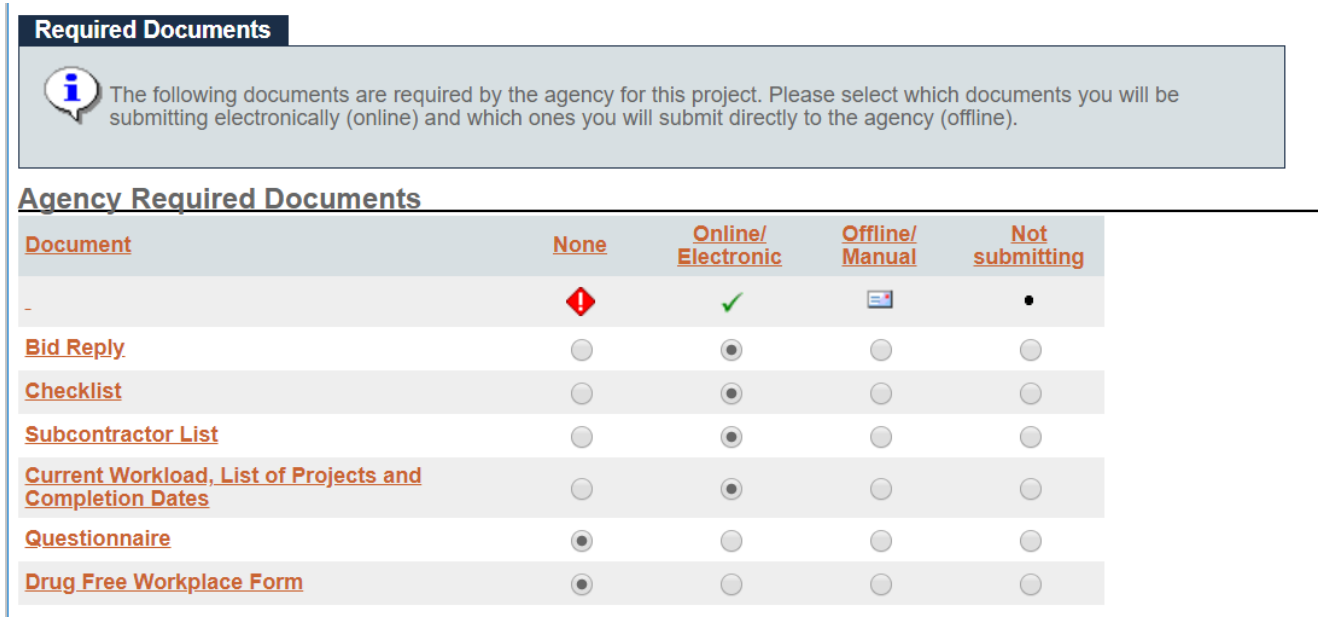
2. Enter you contact information and enter in all required fields

Note: You **MUST** put a number of the “BID AMOUNT” box. However, that number can be 0 so as to allow for a more detailed descriptions of your bid through your uploaded documents.



In order to do e-bidding

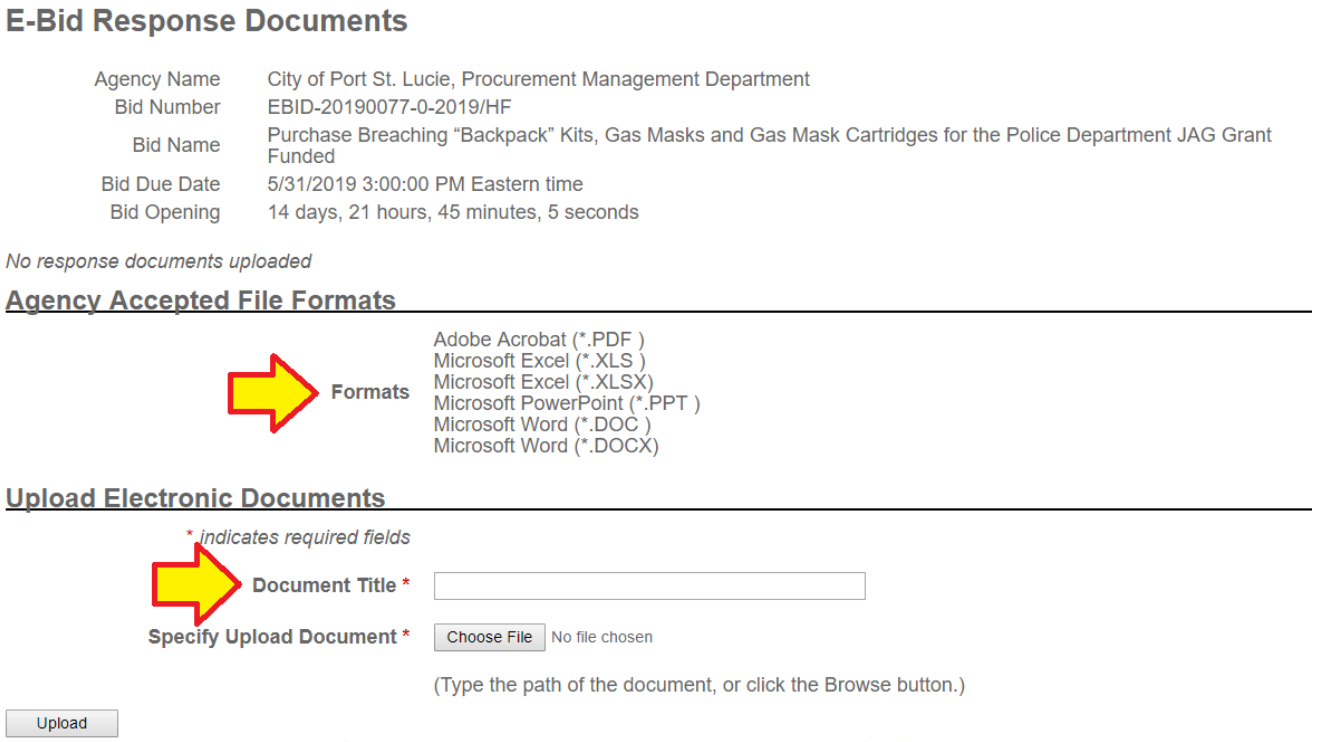
- In the agency required documents section – check the documents you intend on uploading and fulfilling. By checking these boxes this is **ONLY** an acknowledgement of how you will fulfill the requirement. You still have to upload the documents.



In order to do e-bidding

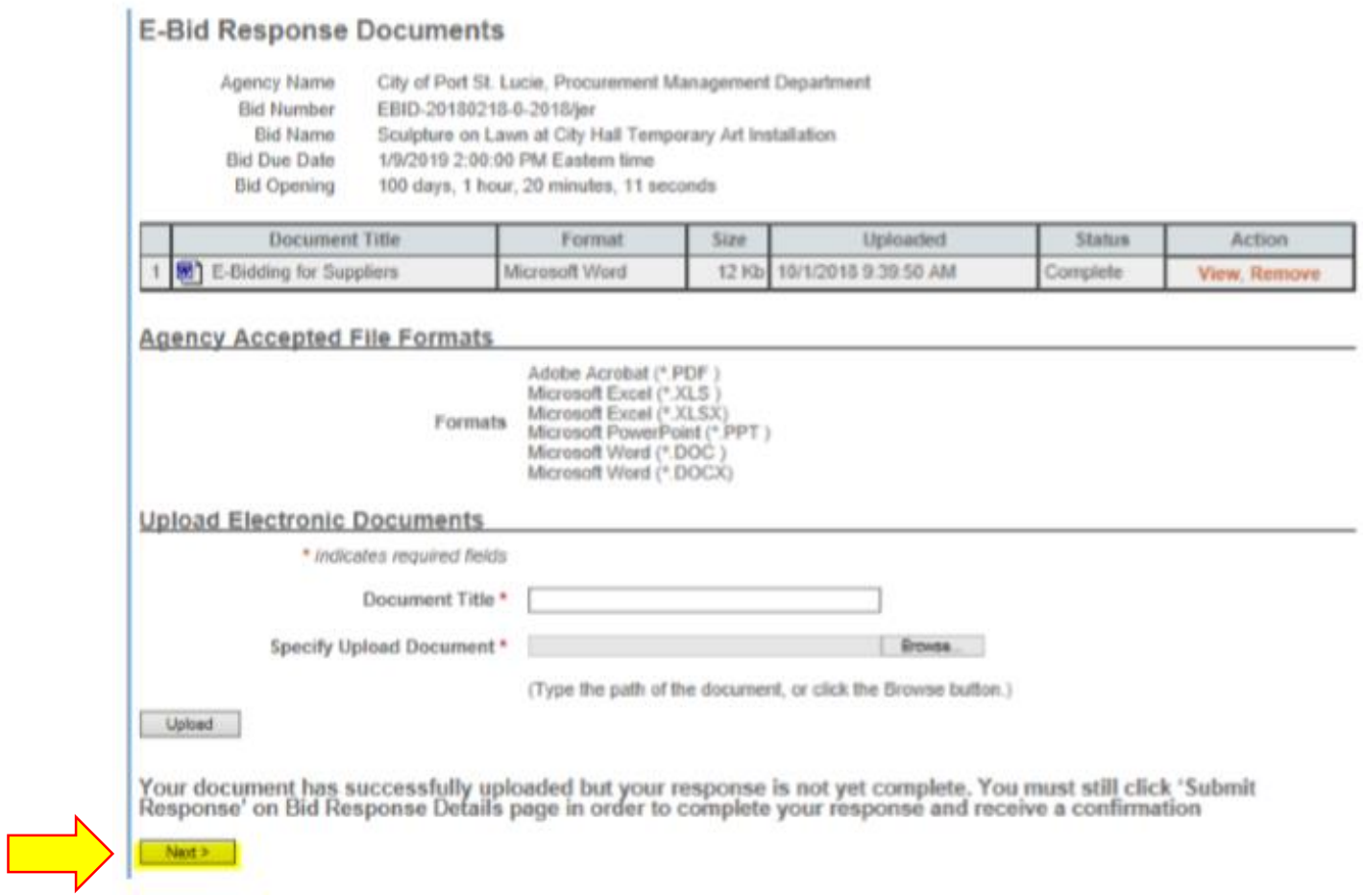
Upload your response documents in an accepted file format

Make sure that you have covered and uploaded all the required documents



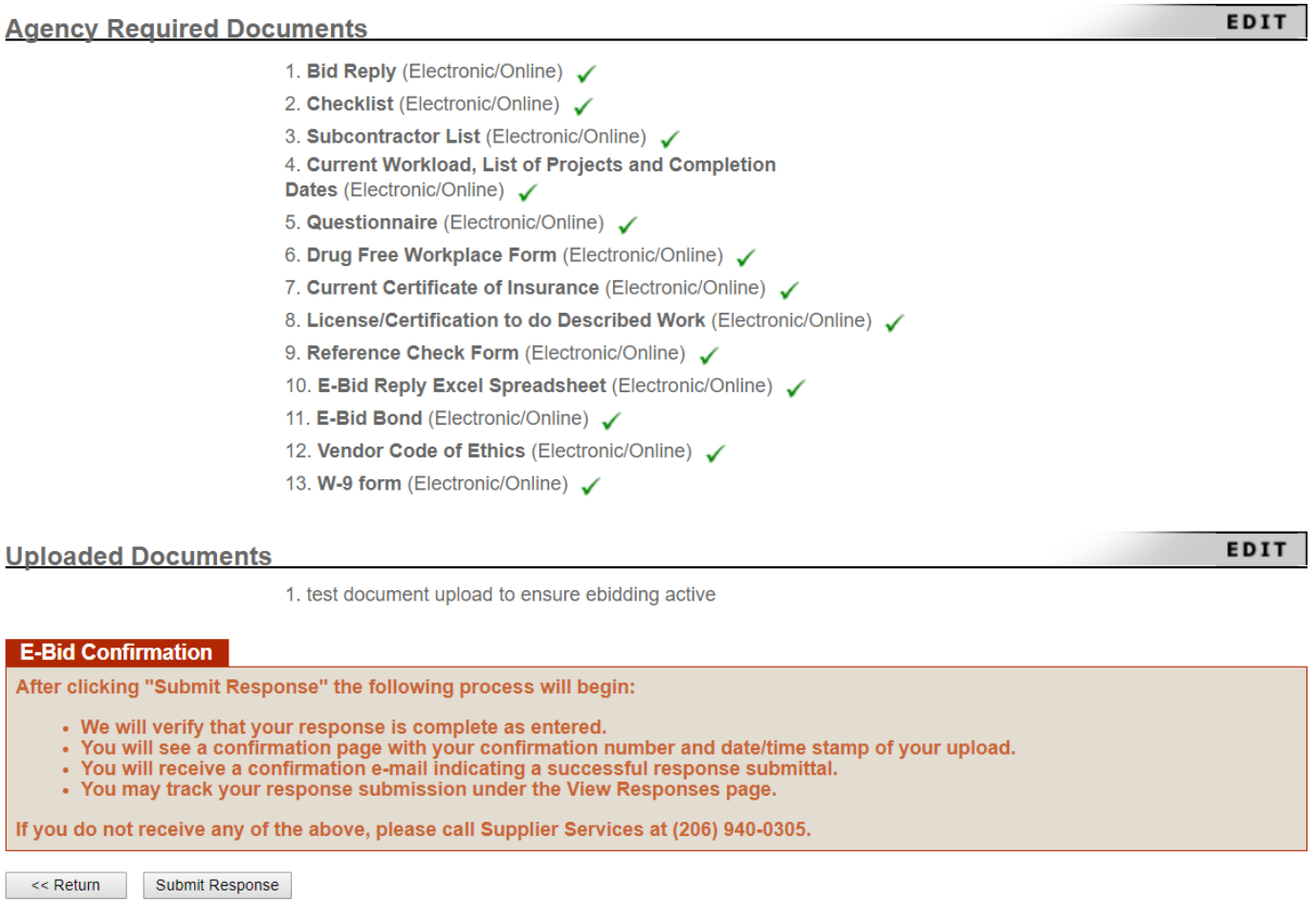
In order to do e-bidding

Once you decide you've uploaded all your documents that you would like to submit, make sure you click the **NEXT** button at the bottom of the screen



Completing your e-bid submittal

- Please **VERIFY** that you have attached **ALL** the required documents
- Click on the **Submit Response** button to complete your e-bid



Agency Required Documents EDIT

1. **Bid Reply** (Electronic/Online) ✓
2. **Checklist** (Electronic/Online) ✓
3. **Subcontractor List** (Electronic/Online) ✓
4. **Current Workload, List of Projects and Completion Dates** (Electronic/Online) ✓
5. **Questionnaire** (Electronic/Online) ✓
6. **Drug Free Workplace Form** (Electronic/Online) ✓
7. **Current Certificate of Insurance** (Electronic/Online) ✓
8. **License/Certification to do Described Work** (Electronic/Online) ✓
9. **Reference Check Form** (Electronic/Online) ✓
10. **E-Bid Reply Excel Spreadsheet** (Electronic/Online) ✓
11. **E-Bid Bond** (Electronic/Online) ✓
12. **Vendor Code of Ethics** (Electronic/Online) ✓
13. **W-9 form** (Electronic/Online) ✓

Uploaded Documents EDIT

1. test document upload to ensure ebidding active

E-Bid Confirmation

After clicking "Submit Response" the following process will begin:

- **We will verify that your response is complete as entered.**
- **You will see a confirmation page with your confirmation number and date/time stamp of your upload.**
- **You will receive a confirmation e-mail indicating a successful response submittal.**
- **You may track your response submission under the View Responses page.**

If you do not receive any of the above, please call Supplier Services at (206) 940-0305.

<< Return | Submit Response

Confirmation of Response

- When you complete you will receive a confirmation
- This is a confirmation that what you uploaded will be visible to the agency when the bid closes, **this is not** a confirmation that all your documents were fill out or submitted correctly

E-Bid Response Details

Agency Name	City of Port St. Lucie, Procurement Management Department
Bid Number	EBID-20180218-0-2018/jer
Bid Name	Sculpture on Lawn at City Hall Temporary Art Installation
Bid Due Date	1/9/2019 2:00:00 PM Eastern time
Bid Opening	100 days, 1 hour, 6 minutes, 46 seconds
Response #	15104
Results	Your bid response is submitted.

<< Return

Post Submission Edits

If you feel like you missed something or need to make a change you can go back to your submittal response and edit your e-bid. By clicking on “DETAILS” then “EDIT” the section you wish

Bid Identifier	Agency Name	Bid Status	Broadcast	Date Due ▽	Name	Status	Actions
EBID-20190077-0-2019/HF	City of Port St. Lucie, Procurement Management Department	Active	4/25/2019	5/31/2019	Purchase Breaching “Backpack” Kits, Gas Masks and Gas Mask Cartridges for the Police Department JAG Grant Funded	Incomplete	Details, Bid, History

Contact Information EDIT

Company Name	Sample DBE Company
Address 1	509 Olive Way
Address 2	
City	Seattle
State	Washington
Postal Code	98101
Phone	2063739233
Fax	2063739233
Country	United States of America
Bid Amount	$0.00
Alternate Bid Amount	
Notes	

Agency Required Documents EDIT

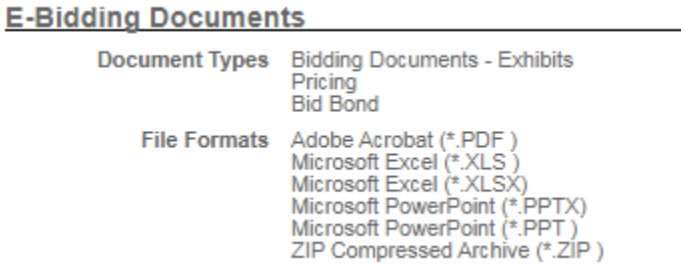
1. **Bid Reply** (Electronic/Online) ✓

DemandStar E-Bidding: Frequently Asked Questions

- Do suppliers need to be registered with DemandStar to participate in e-bidding?
  Yes. But if they don't already have an account with DemandStar, they can sign up and either
  - Be a subscriber for only your agency, at no charge, and be able to download documents at no charge and then receive notifications that match their commodity codes
  - Be a "basic supplier" for free - who researches on our platform and then pays $5 to download all documents, thus becoming a plan holder
  - Be a paid subscriber for a county, state, national and receive notifications from all included agencies

- Can suppliers respond with document uploads or do they simply fill in forms?
  Yes, they may respond with document uploads that are available to you via the DemandStar platform.

- What type of E-Bidding Documents can be uploaded?
  Acceptable file formats for sending back documents that the city will accept:



- Is there a maximum file size that I can upload?
  Vendors can simply upload a single file or multiple documents as long as it doesn't exceed 100 MBs (single or multiple files)

- After a bid opening, what document(s) are made public by DemandStar?
  None. Only the agency can see the vendor responses so you are the only ones who will determine what you want to download and make public.

- Who do I call if I have questions or problems with the DemandStar?
  The City strongly encourages each respondent to setup their account and to explore the eBidding module at least a couple of days before the bid due date.

  If you have questions or issues creating your account, accessing the eBidding module or submitting your bid prior to the bid due date, please contact DemandStar at 866.273.1863 or by email at hello@demandstar.com.