**ARLINGTON COUNTY, VIRGINIA**
**OFFICE OF THE PURCHASING AGENT**
**2100 CLARENDON BOULEVARD, SUITE 500**
**ARLINGTON, VA 22201**
**(703) 228-3410**

**INVITATION TO BID NO. 24-DES-ITBPW-432**

**ELECTRONIC SEALED BIDS WILL BE RECEIVED BY ARLINGTON COUNTY VIA VENDOR REGISTRY UNTIL 2:00 P.M. ON WEDENESDAY, JANUARY 24TH, 2024**

**FOR THE PROVISION OF ELECTRIC PANELBOARD REPLACEMENT & INSTALLATION SERVICES**

**VENDORS ARE REQUIRED TO REGISTER ON VENDOR REGISTRY IN ORDER TO SUBMIT A RESPONSE TO THIS INVITATION TO BID. NO RESPONSES WILL BE ACCEPTED AFTER THE BID DUE DATE AND TIME.**

The County will conduct a virtual bid opening via Microsoft Teams Application (APP). Bidders interested in viewing the public bid opening must download the APP and join the meeting via the Microsoft Teams APP and enable audio, video or both. The link to join the virtual bid opening is provided below:

Join Microsoft Teams Meeting
+1 347-973-6905 United States, New York City (Toll)
Conference ID: 208072024#

Bid Surety in the amount of not less than 5% of the bid must be submitted with the bid. Performance and Payment Bonds in the amount of 100% of the award will be required of the successful bidder.

**PREBID CONFERENCE**

A virtual prebid conference will be held at 10:00 a.m. on Tuesday, January 9th, on Microsoft Teams to allow potential Bidders an opportunity to obtain clarification of the specifications and requirements of the solicitation. To join the meeting, please click the following link, or join by dialing +1 347-973-6905 and enter Conference ID 705487831#. ATTENDANCE AT THE PREBID CONFERENCE IS OPTIONAL. Minutes of the prebid conference will be recorded by the County and may be incorporated into the solicitation documents through an Addendum. Interested Bidders are, however, urged to attend.

NOTICE: ANY BIDDER ORGANIZED AS A STOCK OR NONSTOCK CORPORATION, LIMITED LIABILITY COMPANY, BUSINESS TRUST, OR LIMITED PARTNERSHIP OR REGISTERED AS A LIMITED LIABILITY PARTNERSHIP MUST BE AUTHORIZED TO TRANSACT BUSINESS IN THE COMMONWEALTH OF VIRGINIA BEFORE CONTRACT AWARD (REFER TO AUTHORITY TO TRANSACT BUSINESS SECTION IN THE SOLICITATION FOR FURTHER INFORMATION)

Arlington County reserves the right to reject any and all bids, cancel this solicitation, and to waive any informalities or irregularities in procedure. A bidder's submission of a bid indicates acceptance of these terms.

Arlington County, Virginia
Office of the Purchasing Agent

Lucas Alexander, VCO, VCA
Procurement Officer
lalexander@arlingtonva.us

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## I. INFORMATION FOR BIDDERS

### 1. QUESTIONS AND ADDENDA

BIDDERS MUST BE REGISTERED IN VENDOR REGISTRY TO SUBMIT A QUESTION FOR THIS INVITATION TO BID.

All communications relating to this solicitation must be submitted online using Vendor Registry. For a question to be considered, the question must be entered in the Question Section of the **ITB No**. **24-DES-ITBPW-432** Prior to the award of a contract resulting from this solicitation, bidders are prohibited from contacting any County staff other than those assigned to the Office of the Purchasing Agent.

**QUESTIONS REGARDING THE ORIGINAL SOLICITATION MUST BE SUBMITTED BY FRIDAY, JANUARY 12TH, 2024 AT 5:00 PM EASTERN TIME TO BE CONSIDERED FOR AN ADDENDUM. ALL QUESTIONS RECEIVED BY THE QUESTION DEADLINE WILL BE RESPONDED TO WITHIN VENDOR REGISTRY AND POSTED FOR ALL BIDDERS. THE SYSTEM WILL NOT ACCEPT ANY QUESTIONS AFTER THIS DATE AND TIME.**

If any questions or responses require revisions to this solicitation, such revisions will be by formal Addendum only. Bidders are cautioned not to rely on any written, electronic, or oral representations made by any County representative or other person, including the County's technical contact, that appear to change any portion of the solicitation unless the change is ratified by a written Addendum to this solicitation issued by the Office of the Purchasing Agent.

### 2. INTEREST IN MORE THAN ONE BID AND COLLUSION

Reasonable grounds for believing that a Bidder is interested in more than one bid for a solicitation, including both as a Bidder and as a subcontractor for another Bidder, or that collusion exists between two or more Bidders, will result in rejection of all affected bids. However, an individual or entity acting only as a subcontractor may be included as a subcontractor on bids of two or more different Bidders. Bidders rejected under the above provision will also be disqualified if they respond to a re-solicitation for the same work.

### 3. TRADE SECRETS OR PROPRIETARY INFORMATION

Trade secrets or proprietary information that a bidder or contractor submits in connection with a procurement transaction may be exempted from public disclosure under the Virginia Freedom of Information Act ("VFOIA"). However, the bidder or contractor must invoke VFOIA protection clearly and in writing on the Bid Form for County review. The Bid Form must include at least the following: (1) the data or other materials sought to be protected and (2) specific reasons why the material is confidential or proprietary. It is the bidder's sole responsibility to defend such exemptions if challenged in a court of competent jurisdiction.

### 4. DEBARMENT STATUS

The Bidder must indicate on the Bid Form whether it or any of its principals is currently debarred, enjoined, or suspended from submitting bids to the County or to any other state or political subdivision and whether the Bidder is an agent of any person or entity that is currently debarred, enjoined or suspended from submitting bids to the County or to any other state or political subdivision. An affirmative response may be considered grounds for rejection of the bid.

## 5. AUTHORITY TO TRANSACT BUSINESS

Any Bidder organized as a stock or nonstock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership must be authorized to transact business in the Commonwealth of Virginia as a domestic or foreign business entity if so required by Title 13.1 or Title 50 of the Code of Virginia, or as otherwise required by law. The proper and full legal name of the entity and the identification number issued to the Bidder by the Virginia State Corporation Commission must be included on the Bid Form. Any Bidder that is not required to be authorized to transact business in the Commonwealth must include in its bid a statement describing why the Bidder is not required to be so authorized. The County may require a Bidder to provide documentation that 1) clearly identifies the complete name and legal form of the entity and 2) establishes that the entity is authorized by the State Corporation Commission to transact business in the Commonwealth of Virginia. Failure of a Bidder to provide such documentation will be a ground for rejection of the bid or cancellation of any award. For further information refer to the Commonwealth of Virginia State Corporation Commission website at: www.scc.virginia.gov.

The County reserves the right to waive this requirement at any time, for any reason.

## 6. ARLINGTON COUNTY BUSINESS LICENSES

The successful Bidder must comply with the provisions of Chapter 11 ("Licenses") of the Arlington County Code, if applicable. For information on the provisions of that Chapter and its applicability to this solicitation, contact the Arlington County Business License Division, Office of the Commissioner of the Revenue, at 2100 Clarendon Blvd., Suite 200, Arlington, Virginia, 22201, tel. (703) 228-3060, or e-mail business@arlingtonva.us.

## 7. VIRGINIA CONTRACTOR LICENSE

For all work that is classified as being performed by "Contractors" as defined by the Virginia State Board for Contractors, a Class A, B, or C License is required.

If a contract for performing or managing construction, removal, repair or improvements is for $120,000 or more, or if the total value of all such construction, removal, repair, or improvements undertaken by the bidder within any twelve-month period is $750,000 or more, the bidder is required under Title 54.1, Chapter 11, Code of Virginia, as amended, to be licensed as a "CLASS A CONTRACTOR."

If a contract for performing or managing construction, removal, repair or improvements is for $10,000 or more, but less than $120,000, or if the total value of all such construction, removal, repair, or improvements undertaken by the bidder within any twelve-month period is $150,000 or more, but less than $750,000, the bidder is required under Title 54.1, Chapter 11, Code of Virginia, as amended, to be licensed as a "CLASS B CONTRACTOR."

If a contract for performing construction, removal, repair or improvements is for $1,000 or more, but no more than $10,000 or if the total value of all such construction, removal, repair, or improvements undertaken by the bidder within any twelve-month period is less than $150,000, the bidder is required under Title 54.1, Chapter 11, Code of Virginia, as amended, to be licensed as a "CLASS C CONTRACTOR." Class C contractors shall not include electrical, plumbing, and heating, ventilation and air conditioning contractors.

For further information, contact the State Board for Contractors, 2 South Ninth Street, Richmond, VA 23219, (804) 367-8511.

## 8. ESTIMATED QUANTITIES/NON-EXCLUSIVITY OF CONTRACTOR

The contract that will result from this solicitation will not obligate the County to purchase a specific quantity of items or services during the Contract Term. Any quantities that are included in the contract documents are the present expectations the County for the period of the contract, and the County is under no obligation to buy that, or any, amount as a result of having provided this estimate or of having had any normal or otherwise measurable requirement in the past. The County may require more goods and/or services than the estimated annual amount, and any such additional quantities will not give rise to any claim for compensation other than at the unit prices and/or rates specified in the contract.

The items or services covered by this contract may be or become available under other County contract(s), and the County may determine that it is in its best interest to procure the items or services through such other contract(s). The County does not guarantee that the selected contractor will be the exclusive provider of the goods or services covered by the resulting contract.

## 9. PREVAILING WAGE CONTRACT FOR CONSTRUCTION SERVICES

This solicitation and the resulting contract are subject to Prevailing Wage provisions covered under Article 4-104 of the Arlington County Purchasing Resolution. All employees of any contractor or any subcontractor working on the contract shall be paid wages, salaries, benefits, and other remuneration at or above the craft or trade category prevailing wage rate indicated by Virginia Commissioner of Labor and Industry (DOLI) and as listed in the contract. The County will request from DOLI a wage determination at bid posting and a final wage determination at contract award. If the final wage determination changes at contract award, the Bidder shall submit their revised bid pricing to comply with the final wage determination from DOLI. By submitting a response to the solicitation, the Bidder certifies that it will comply with this provision and will ensure that its subcontractors, if any, also comply with the prevailing wage provisions. (Refer to draft Contract Terms and Conditions for further Prevailing Wage details specific to this solicitation/contract.)

## 10. BID FORM SUBMISSION

The submitted Bid Form must be signed and fully executed. The Bid Form must be submitted electronically via Vendor Registry no later than the date and time specified in this solicitation. The Vendor Registry system will not accept bids after the close date and time. The County will not accept emailed or faxed bids.

The Bidder name on the electronic bid submittal shall be the same as the Contractor/Vendor name as the registration in Vendor Registry for the upload to be considered a valid bid. ONLY ELECTRONIC SUBMISSION IS ALLOWED, NO BID SUBMITTED OTHER THAN A VENDOR REGISTRY ELECTRONIC UPLOAD WILL BE ACCEPTED. **Arlington County is not responsible for late submissions, missed Addendums, or questions not submitted before the end date and time.**

Timely submission is solely the responsibility of the Bidder. The Vendor Registry System will not accept applications after the publicly posted date and time. A bid may be rejected if the Bid Form is not signed in the designated space by a person authorized to legally bind the Bidder.

Modification of or additions to the Bid Form may be cause for rejection of the bid; however, Arlington County reserves the right to decide, in its sole discretion, whether to reject such a bid as nonresponsive.

As a precondition to bid acceptance, Arlington County may request the bidder to withdraw or modify any such modifications or additions, if it does not affect quality, quantity, price, or delivery.

Bids and all documents uploaded/submitted to Arlington County by an Bidder become the property of the County upon receipt.

**11. BIDDER CERTIFICATION**

Submission of a signed Bid Form is certification by the respective bidder that it is registered with the Virginia State Corporation Commission (SCC), if applicable, it is the legal entity authorized to enter into an agreement with the County, and that it will accept any award made to it as a result of the submission. Entry of a Bidder's SCC number may be required at Vendor Registration.

**12. ERRORS IN EXTENSION**

If the unit price and the extension price differ, the unit price will prevail.

**13. EXCEPTIONS**

Conditional or qualified bids containing exceptions, unless specifically allowed in the solicitation, are subject to rejection in whole or in part as nonresponsive.

**14. NONCONFORMING TERMS AND CONDITIONS**

If a bid contains alternate terms and conditions that do not conform to the terms and conditions in this solicitation, the bid will be subject to rejection for nonresponsiveness. The County reserves the right to permit a bidder to withdraw nonconforming terms and conditions from its bid prior to the County's determination of nonresponsiveness.

**15. BIDDERS' RESPONSIBILITY TO INVESTIGATE**

Before submitting a bid, each bidder must make all investigations necessary to ascertain all conditions and requirements affecting the full performance of the contract and to verify any representations made by the County upon which the bidder will rely. No pleas of ignorance of such conditions and requirements will relieve the successful bidder from its obligation to comply in every detail with all provisions and requirements of the contract or will be accepted as a basis for any claim for any monetary consideration on the part of the successful bidder.

**16. SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK**

Each bidder is responsible for ascertaining the nature and locations of the Work of the solicitation, and for investigating the general and local conditions and factors which can affect the work or its cost, including but not limited to:

a. conditions bearing upon transportation, disposal, handling, and storage of materials;
b. the availability of labor, water, electric power, and roads;
c. uncertainties of weather, river stage, tides, or similar physical conditions at the site;
d. the conformation and conditions of the ground; and
e. the character of equipment and facilities needed before and during work performance.

Each bidder is responsible for investigating the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work publicly or otherwise available, as well as from the drawings and specifications made a part of this solicitation.

The locations of existing utilities, including underground utilities, which may affect the work are indicated on the drawings or in the specifications insofar as their existence and location were known at the time of preparation of the drawings. However, nothing in these drawings or specifications shall be construed as a guarantee that such utilities are in the location indicated or that they actually exist, or that other utilities are not within the area of operations. The bidder shall make all necessary investigations to determine the existence and locations of such utilities.

The County assumes no responsibility for any conclusions or interpretations made by the bidder based on the information made available by the County. The County assumes no responsibility for any understanding reached or representation made concerning conditions which could affect the work by any of its officers or agents before the execution of the contract, unless that understanding, or representation is expressly stated in the Contract.

**17. INCOMPLETE DOCUMENTS**

Each bidder is responsible for having determined the accuracy and/or completeness of the solicitation documents upon which it relied in making its bid, and has an affirmative obligation to notify the Arlington County Purchasing Agent immediately upon discovery of an apparent or suspected inaccuracy, error in, or omission of any pages, drawings, sections, or addenda whose omission from the documents was apparent from a reference or page numbering or other indication in the solicitation documents.

If a bidder downloads an electronic version of the solicitation documents, that potential bidder is responsible for determining the accuracy and/or completeness of the electronic documents and ensuring that the electronic documents used in preparing the bid are the most current version of solicitation documents issued by the County.

If the successful bidder proceeds with any activity that may be affected by an inaccuracy, error in, or omission in the solicitation documents of which it is aware but has not notified the Arlington County Purchasing Agent, the bidder hereby agrees to perform any activity described in the missing or incomplete documents at bidder's sole expense and at no additional cost to Arlington County.

**18. ERRONEOUS OR INFEASIBLE REQUIREMENTS**

Each bidder is responsible for having determined the feasibility of the work required and shall notify the County Purchasing Agent immediately upon discovery of any apparent erroneous, contradictory, incomplete, or infeasible requirements or directions contained in the Solicitation Documents. If a bidder fails to notify the County of such conditions immediately upon discovery, the bidder assumes all responsibility for any and all work required to satisfy the contract requirements at no additional cost to the County and within the Time for Completion.

**19. QUALIFICATION OF BIDDERS**

In order to be considered responsible and responsive Bidders shall have the experience described below, and provide the supporting documentation as instructed.

COMPANY QUALIFICATIONS:

Bidders shall have five [5] continuous years of experience conducting public works infrastructure and [electrical systems upgrades including panelboards and transformers replacement] projects. The experience shall be work of similar size and scope, construction, re-construction, and maintenance. The Bidder's obtained project experience shall consist of the following:

- Have completed at least three (3) electrical systems upgrade projects with a construction value of $700k or greater.
- Have completed a project that includes replacement of panelboards and/or transformers.
- Have completed similar electrical upgrade projects in occupied buildings, demonstrating the ability to manage projects while minimizing disruption to occupants' daily activities and ensuring their safety.

Bidders shall provide a list of three [3] similar projects recently completed projects that involving the same material, equal size, and comparable length. For each project, Bidders shall list the following information:

- Project Name
- Project description and Bidder's scope of work within the project
- Project manager's name, telephone number and email address
- Work start date, scheduled completion, and actual completion date
- Initial contract cost and final contract cost

The experience of the contractor owner(s) may be imputed to a newly formed company/Contractor provided the Contractor owner(s) has/have at least five (5) years of demonstrated experience of reliability and meets the criteria set forth herein.

STAFFING QUALIFICATIONS:

The Foreman/Superintendent/ Project Manager assigned to this work shall have at least four [4] years of experience in overseeing projects of similar type and size. Bidders shall submit the resume of the proposed Forman/Superintendent/Project Manager with their Bids.

In addition, the Purchasing Agent may require a bidder to demonstrate that it has the necessary facilities, ability, and financial resources to comply with the contract and furnish the service, material or goods specified herein in a satisfactory manner before the award of any contract. A bidder may also be required to provide past history and references. Failure to qualify according to the foregoing requirements will result in bid rejection.

**20. <u>ALTERNATE BID</u>**

Bidders who have other items they wish to offer in lieu of, or in addition to, what is required by this solicitation shall submit a separate bid clearly marked "ALTERNATE BID". Alternate bids will be automatically deemed nonresponsive.

**21. <u>INFORMALITIES</u>**

The County reserves the right to waive minor defects or variations from the exact requirements of the solicitation in a bid insofar as those defects or variations do not affect the price, quality, quantity, or delivery schedule of the services being procured. If insufficient information is submitted for Arlington County to properly evaluate a bid or a bidder; the County may request such additional information after bid opening, provided that the information requested does not change the price, quality, quantity, or delivery schedule for the services being procured.

## 22. NEW MATERIAL

Unless otherwise provided for in this solicitation, all goods, materials, supplies, or components offered to the County under this bid solicitation must be new, not used or reconditioned, and are not of such age or so deteriorated as to impair their usefulness or safety and that the goods, materials, supplies, or components offered are current production models of the respective manufacturer. If a bidder believes that furnishing used or reconditioned goods, materials, supplies or components will be in the County's interest, the bidder shall notify the County Purchasing Agent in writing no later than fifteen (15) calendar days prior to the date set for opening of bids. The notice shall include the reasons for the request and any benefits which may accrue to the County if the Purchasing Agent authorizes the bidding of used or reconditioned goods, materials, supplies or components.

## 23. BID WITHDRAWAL PRIOR TO BID OPENING

The Bidder may withdraw a bid from Vendor Registry before the opening date and time. It is the sole responsibility of the Bidder to remove and/or resubmit a bid before the bid deadline.

## 24. WITHDRAWAL OF BID FROM CONSIDERATION AFTER BID OPENING

After the opening of a bid, a bidder may withdraw its bid from consideration if the price of the bid is substantially lower than other bids due solely to a mistake therein, provided the bid is submitted in good faith, the mistake is a clerical mistake as opposed to a judgment mistake, and is actually due to an unintentional arithmetic error or an unintentional omission of a quantity of work, labor or material made directly in the compilation of the bid, which unintentional error or unintentional omission can be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the bid sought to be withdrawn. No partial withdrawals of bids will be permitted after the time and date set for the bid opening. The bidder must give an electronic written notice to the Arlington County Purchasing Agent of a claim of right to withdraw a bid and provide all work papers, documents and other materials used in the preparation of the bid sought to be withdrawn, within two (2) business days after the date of bid opening. A bid may also be withdrawn if the County fails to award or issue a notice of intent to award the bid within ninety (90) days after the date fixed for opening bids.

## 25. METHOD OF AWARD

The County will award to the lowest responsive and responsible bidder. The lowest bidder will be determined by the Grand Total as indicated on the Pricing Sheet.

## 26. NOTICE OF DECISION TO AWARD

When the County has made a decision to award a contract(s), the County will post a Notice of Award or Intent to Award to Vendor Registry.

## 27. INSURANCE REQUIREMENTS

Each bidder must be able to demonstrate proof of the specific coverage requirements and limits applicable to this solicitation. If the bidder is not able to do so, it may propose alternate insurance coverage for consideration by the County. Written requests for consideration of alternate coverage must be received by the County Purchasing Agent at least 10 working days prior to bid due date. If the County permits alternate coverage, an amendment to the Insurance Checklist will be issued prior to the time and date set for receipt of bids.

## 28. SURETY REQUIRED

Companies who wish to implement digital signatures may do so, along with a SURETY BOND SEAL ADDENDUM which contains an electronic corporate seal and states the following:

[Surety Company] has authorized its Attorney-in-Fact to affix [Surety Company's] corporate seal to any bond executed on behalf of [Surety Company] by any such Attorney-in-Fact by attaching this Addendum to said bond.

To the extent this Addendum is attached to a bond that is executed on behalf of [Surety Company] by its Attorney-in-Facts, [Surety Company\ hereby agrees that the seal below shall be deemed affixed to said bond to the same extent as if its raised corporate seal was physically affixed to the face of the bond."

A. BID SURETY:
A fully completed and properly executed original Bid Bond, cashier's check, certified check, money order, or cash escrow in the amount of 5% of the amount of the bid made payable to the Treasurer of Arlington County shall accompany each bid. The Bid Surety will be retained until after the award to the successful bidder. The Bid Surety of the successful bidder will be retained until completion of the Contract or the posting of a Performance Bond, whichever occurs sooner. A bid submitted without a proper bid surety will be rejected.

B. FAILURE TO EXECUTE:
The failure of a bidder to accept an award and file acceptable Performance and Payment Bonds within ten (10) days after award notice will cause cancellation of the award and the forfeiture of the Bid Surety to the County.

C. PERFORMANCE SURETY:
A fully completed and properly executed original Performance Bond in the amount of 100% of the amount of the bid will be required of the successful bidder to ensure satisfactory completion of the work. The bond shall be a corporate surety bond issued by a surety company authorized to do business in the Commonwealth of Virginia and acceptable to the County. Where applicable, the Performance Bond shall be renewable annually in the original amount through the completion of the Contract, including all warranty and guarantee periods.

D. PAYMENT BOND:
A fully completed and properly executed original Payment Bond in the amount of 100% of the amount of the bid, will be required of the successful bidder to ensure payment of all persons who have and fulfill contracts for the Contractor for performing labor, providing equipment, or providing material in the performance of the work provided for in the Contract. The Bond shall be a corporate surety bond issued by a surety company authorized to do business in the Commonwealth of Virginia and acceptable to the County. Where applicable, the Payment Bond shall be renewable annually in the original amount for the duration of the Contract.

## 29. EXECUTION OF CONTRACT

Within three days after the Contract is presented to the successful Bidder for signature, the Contractor must submit to the County Purchasing Agent the original of the executed Agreement. Within ten days the Contractor must submit executed performance and payment bonds and required certificate of insurance. Failure to do so shall constitute a default, and the County may award the Contract to the next lowest responsive and responsible bidder or solicit new bids. The County may then charge against the Contractor

the difference between the amount of the Contract award and the amount for which a Contract is subsequently executed, up to the total amount of the Contractor's bid security.

**30. EXPENSES INCURRED IN PREPARING BID**

All expenses related to a bid are the sole responsibility of the bidder.

**31. NEGOTIATIONS WITH LOWEST RESPONSIVE AND RESPONSIBLE BIDDER**

If the bid by the lowest responsive and responsible bidder exceeds available funds, the County reserves the right to negotiate with the apparent low bidder to obtain an acceptable price. Negotiations with the apparent low bidder may involve discussions of reduction of quantity, quality, or other cost saving mechanisms. The final negotiated contract shall be subject to final approval of the County, in its sole discretion.

**32. ELECTRONIC SIGNATURE**

If awarded, the Bidder may be required to accept an agreement and sign electronically through the County's e-signature solution, DocuSign.

FOLLOWING THIS PAGE IS THE AGREEMENT THAT WILL BE ENTERED INTO BETWEEN THE COUNTY AND THE CONTRACTOR. THE AGREEMENT IS PART OF THIS SOLICITATION. THIS AGREEMENT IS SUBJECT TO REVIEW BY THE COUNTY ATTORNEY PRIOR TO BEING SUBMITTED FOR CONTRACTOR'S SIGNATURE.

## II. AGREEMENT AND CONTRACT TERMS AND CONDITIONS

**ARLINGTON COUNTY, VIRGINIA**
**OFFICE OF THE PURCHASING AGENT**
**SUITE 500, 2100 CLARENDON BOULEVARD**
**ARLINGTON, VA 22201**

**AGREEMENT NO. 24-DES-ITBPW-432**

THIS AGREEMENT is made, on the date of execution by the County, between ____*Contractor's name*___, _____*Contractor's address*___ ("Contractor") a _____*name of state*_____ __*type of entity*__ authorized to do business in the Commonwealth of Virginia, and the County Board of Arlington County, Virginia ("County"). The County and the Contractor, for the consideration hereinafter specified, agree as follows:

### 1. CONTRACT DOCUMENTS

The Contract Documents consist of:

- Agreement No. 24-DES-ITBPW-432 and all modifications properly incorporated into the Agreement,
- Exhibit A – Arlington County Invitation to Bid No. 24-DES-ITBPW-432, including DES General Conditions, Special Conditions, and Supplementary Specifications
- Exhibit B – Specifications, Drawings and Construction Notes
- Exhibit C – Virginia Department Of Labor And Industry Wage Determination Decision
- Exhibit D – Price Bid of Contractor
- Exhibit E – Contractor Performance Evaluation Form

Where the terms and provisions of this Agreement vary from the terms and provisions of the other Contract Documents, the terms and provisions of this Agreement will prevail over the other Contract Documents, and the remaining Contract Documents will be complementary to each other. If there are any conflicts, the most stringent terms or provisions will prevail.

The Contract Documents set forth the entire agreement between the County and the Contractor. The County and the Contractor agree that no representative or agent of either party has made any representation or promise with respect to the parties' agreement that is not contained in the Contract Documents. The Contract Documents may be referred to below as the "Contract" or the "Agreement".

### 2. SCOPE OF WORK

The Contractor will furnish all labor, materials, and equipment for the construction of electric panelboard replacement and installation services (the "Project") and all other work shown, described, and required by the Contract Documents (hereinafter "the Work").

The Work shall be performed according to the standards established by the Contract Documents read together as a single specification. It shall be the Contractor's responsibility, at solely the Contractor's cost, to provide sufficient services to fulfill the purposes of the Work. Nothing in the Contract Documents shall be construed to limit the Contractor's responsibility to manage the details and execution of its Work.

**3. PROJECT OFFICER**

The performance of the Contractor is subject to the review and approval of the County Project Officer identified in Section 53, Notices, unless the Contractor is otherwise notified in writing.

**4. TIME FOR COMPLETION**

Work under this Agreement shall achieve Substantial Completion no later than five hundred and forty (540) consecutive calendar days after the commencement date given in a Notice to Proceed provided by the County to the Contractor, subject to any modifications made as provided for in the Contract Documents. This five hundred and forty (540) day period shall be the Period of Performance for Substantial Completion. No Work shall be deemed Substantially Complete until it meets the requirements of Substantial Completion set forth in the General Conditions. Final Completion of the Work shall be completed no later than thirty (30) calendar days after the date of acceptance of Substantial Completion by the County Project Officer. Work will not reach Final Completion until it meets the requirements set forth in the General Conditions.

**5. CONTRACT AMOUNT**

The County will pay the Contractor in accordance with the terms of the Progress Payments and Retainage and Payment Terms sections below and at the prices shown in Exhibit D for the Contractor's completion of the Work as required by the Contract Documents provided the Work is performed to the satisfaction of and is accepted by the Project Officer. The Contractor will complete the Work for the total amount specified in this section ("Contract Amount") unless such amount is modified as provided in this Agreement. The Contract Amount includes all of the Contractor's costs and fees (profit) and is inclusive of all anticipated or known site conditions, anticipated or known materials, labor, and equipment costs, or any other costs which should reasonably have been expected by the Contract Documents.

**6. PROGRESS PAYMENTS AND RETAINAGE**

The County will make monthly progress payments to the Contractor upon written application by the Contractor, on the basis of a written estimate of the work performed during the preceding calendar month as approved by the Project Officer. However, 5% of each progress payment will be retained by the County until Final Completion and acceptance of all Work covered by the Agreement.

All material and work covered by partial payments will become the property solely of the County at the time the partial payment is made. However, the Contractor will have the sole responsibility, care and custody for all materials and work upon which payments have been made until Substantial Completion.
When calculating payment for materials on-site, the County shall not pay for materials which are not scheduled for incorporation into the Work within sixty (60) days from the date of application for payment.

**7. PAYMENT TERMS**

The Contractor must submit invoices to the County's Project Officer, who will either approve the invoice or require corrections. The County will pay the Contractor 45 days after approval of an invoice for completed work which is reasonable and allocable to the Contract. All payments will be made from the County to the Contractor via ACH. The number of the County Purchase Order pursuant to work has been performed must appear on all invoices.

The Contractor also must submit to the County's Project Officer its W-9 Form, which will include its Federal Employer Identification Number ("FEIN") or Social Security Number ("SSN"), whichever is applicable, before the County can process payment to the Contractor under the Contract.

**8. PAYMENT OF SUBCONTRACTORS**

The Contractor is wholly responsible for the entire amount owed to any subcontractor with which the Contractor contracts in the performance of this Agreement, regardless of whether the Contractor has received payment from the County.

If the Contractor has not received payment from the County for work completed by a subcontractor under this Contract, the Contractor must pay the subcontractor within 60 days of receipt of an invoice from the subcontractor following satisfactory completion of the work. The Contractor is not liable for amounts that are not owed as a result of the subcontractor's noncompliance with the terms of the Contract, in which case the Contractor must notify the subcontractor, in writing within 50 days of receipt of an invoice from the subcontractor for the work, of its intention to withhold payment, in full or in part, and the reason for doing so. The notice must specify the contractual noncompliance, the dollar amount being withheld and the lower-tier subcontractor responsible for the contractual noncompliance, if applicable.

The Contractor is obligated to take one of the two following actions within seven days after receipt of payment by the County for work performed by any subcontractor under this Contract:

a. Pay the subcontractor for the proportionate share of the total payment received from the County attributable to the work performed by the subcontractor under this Contract; or

b. Notify the County and the subcontractor, in writing, of the Contractor's intention to withhold all or a part of the subcontractor's payment with the reason for nonpayment.

The Contractor is obligated to pay interest to the subcontractor on all amounts owed by the Contractor to the subcontractor that remain unpaid after seven days following receipt by the Contractor of payment from the County for work performed by the subcontractor under this Contract, except for amounts withheld as allowed in subsection b., above. Unless otherwise provided under the terms of this Contract, interest will accrue at the rate of 1% per month.

The Contractor must include in each of its subcontracts, if any are permitted, a provision requiring each subcontractor to include or otherwise be subject to the same payment and interest requirements with respect to each lower-tier subcontractor.

The Contractor's obligation to pay an interest charge to a subcontractor pursuant to this section may not be construed to be an obligation of the County. A Contract modification may not be made for the purpose of providing reimbursement for such interest charge. A cost reimbursement claim may not include any amount for reimbursement for such interest charge.

**9. PREVAILING WAGE CONTRACT REQUIREMENTS**

A. Section 4-104 of the Arlington County Purchasing Resolution (regarding "Prevailing Wage) applies to this Contract. All employees of the Contractor and any subcontractors shall be paid wages, salaries, benefits, and other remuneration at or above the craft or trade category

prevailing wage rate indicated by Virginia Commissioner of Labor and Industry (DOLI) and as listed in the contract.

The Contractor and its subcontractors shall submit all certified payrolls and statements of compliance weekly through the eComply website. If the Contractor or any subcontractor does not have an eComply profile, a one-time registration process immediately following the Notice of Award or Notice of Intent to Award and training on system functionality are required for each non-registered entity. The Contractor shall also be responsible for reviewing subcontractor payrolls and ensuring that contract requirements are met.

In addition to applying the prevailing wage rates to its own employees, the Contractor shall include the provisions of this Article 4-104 in every subcontract so that such provisions will be binding upon each subcontractor. The Contractor agrees to assume the obligation that the wage requirements will be observed in fulfilling the requirements of the Contract. The appropriate enforcement sanctions will be invoked against the Contractor and any such subcontractor in the event of such subcontractor's failure to comply with any of the provisions of this Article 4-104.

All wage rates to be used are listed in this Contract in Exhibit C. While DOLI maintains a list of wage determinations online for reference purposes, only the wage determinations made in an official Wage Determination Decision, sent by DOLI to Arlington County, can be used to ascertain the exact rates to be paid for this Contract.

All rates are determined by DOLI and any appeals of specific classification may be made through the Wage Determination Appeal form available at http://www.doli.virginia.gov/wp-content/uploads/2021/04/Appeal-for-Wage-Determination-Clarification.pdf.

B. Upon award of the Contract, the Contractor shall certify, under oath, to the Virginia Commissioner of Labor and Industry and to the County Prevailing Wage Compliance Manager, the pay scale for each craft and trade to be employed for, or to provide labor for, in the Work by the Contractor and any subcontractors. The Contractor's certification shall include all information required by the Code of Virginia § 2.2-4321.3G.

C. The Contractor shall ensure that each individual providing labor as a mechanic, laborer, worker or equivalent shall be accurately classified in confirmation with the Wage Determination.

D. The Contractor shall post the prevailing wage rate for each craft and classification involved as determined by DOLI, including the effective date, in a prominent and easily accessible place at the work site during the time work is being performed. The posting must be in English and any other language that is primarily spoken by the individuals at the work site. Within 10 days of such posting the Contractor shall certify to the County Prevailing Wage Compliance Manager and DOLI its compliance with this subsection at https://www.doli.virginia.gov/wp-content/uploads/2021/04/PW_Posting_Compliance_Form.pdf;

E. The Contractor must fully cooperate with the County Prevailing Wage Compliance Manager to ensure contract compliance requirements ,including but not limited to site visits, wage rate signage, contractor employee interviews, and the submission of certified payroll records.

F. The Contractor must submit to the County Prevailing Wage Compliance Manager and DOLI, within five (5) working days of the end of each month, certification for each craft or trade employed on the project, specifying the total hourly amount paid to employees, including wages and applicable fringe benefits using the Pay Scale Certification Form at https://www.doli.virginia.gov/wp-content/uploads/2021/04/DOLI-Pay-Scale-Certification-for-Public-Works-Projects.pdf. The certification must itemize the amount paid in wages and each applicable benefit and list the names and addresses of any third party fund, plan or program to which benefit payments will be made on behalf of employees.

G. The Contractor shall indemnify and hold harmless the County from any fines, demands, claims, suits, and damages, including attorney's fees, resulting from the Contractor's or any subcontractor's failure to pay the Prevailing Wage.

H. The Contractor and its subcontractors shall keep, maintain, and preserve (i) records relating to the wages paid to and hours worked by each individual performing the work of any mechanic, laborer, or worker; and (ii) a schedule of the occupation or work classification at which each individual performing the work of any mechanic, laborer, or worker on the construction project is employed each work day and week. The Contractor and its subcontractors shall make such records available to the Prevailing Wage Compliance Manager within 10 days of a request or per a regular schedule established in the Contract, and shall certify that records reflect the actual hours worked and the amount paid to its workers for whatever time period is requested. The Contractor and its subcontractors must preserve these records for a period of six (6) years after the expiration or earlier termination of the applicable contract.

I. Any Contractor or subcontractor who pays any mechanic, laborer, or worker for services under this Contract less than the Prevailing Wage shall be liable to such individuals for the payment of all wages due, plus interest at an annual rate of eight percent (8%) from the dates wages were due; and shall be disqualified from bidding on public contracts with any public body until the Contractor or subcontractor has made full restitution. A willful violation of Article 4-104 is a Class I misdemeanor.

J. For questions regarding Prevailing Wage, please email prevailingwage@arlingtonva.us.

## 10. RELEASE AND REQUEST FOR FINAL PAYMENT

In order to receive final payment upon Final Completion of the Project and before Final Acceptance, the Contractor must submit to the Project Officer a signed original notarized copy of the Arlington County Release and Request for Final Payment form per the General Conditions.

## 11. LIQUIDATED DAMAGES

Time is of the essence under this Contract. The Work must be completed within the Time for Completion. The County and the Contractor agree that damages for failure to achieve Substantial Completion of the Work by the date specified under Time for Completion are not susceptible to exact determination but that $1,340.00 per calendar day is in proportion to the actual loss that the County would suffer from such delay. Therefore, the Contractor will pay the County as liquidated damages $1,340.00 per day for each and every day beyond the time for Substantial Completion that the County determines Substantial Completion has not achieved. The County and the Contractor also agree that damages for failure to achieve Final Completion of the Work by the date specified under Time for Completion are not susceptible to exact determination but that $500.00 per calendar day is in proportion to the actual loss the County

would suffer from such delay. Therefore, the Contractor will pay the County as liquidated damages $500.00 per day for each and every day beyond the time for Final Completion until Final Completion is achieved.

The County will be entitled to deduct liquidated damages against any sums owed by the County to the Contractor under this Contract. The Contractor hereby waives any defense as to the validity of any liquidated damages on grounds that such liquidated damages are void as penalties or are not reasonably related to actual damages.

**12. PERFORMANCE OF WORK BY THE CONTRACTOR**

The Contractor shall perform on site, and with its own organization, at least thirty percent (30%) of the total direct labor and at least twenty five percent (25%) of the total work in place to be performed under the Contract. Prior to award, the Contractor must demonstrate to the Project Officer's satisfaction that both of these standards will be met during contract performance. Labor and work to be counted when determining whether the Contractor has met the self-performance requirement shall not include any work that the Contractor performs under the supervision of a subcontractor.

The self-performance percentage may be reduced by an Amendment to the Contract, if during performance of the Work, the Contractor requests a reduction and the Project Officer determines that the reduction would be to the advantage of the County.

**13. NON-APPROPRIATION**

All payments by the County to the Contractor pursuant to this Contract are subject to the availability of an annual appropriation for this purpose by the County Board of Arlington County, Virginia ("Board"). In the event that the Board does not appropriate funds for the goods or services provided under this Contract, the County will terminate the Contract, without termination charge or other liability to the County, on the last day of the fiscal year or when the previous appropriation has been spent, whichever occurs first.

**14. ESTIMATED QUANTITIES/NON-EXCLUSIVITY OF CONTRACTOR**

This Contract does not obligate the County to purchase a specific quantity of items or services during Contract Term. Any quantities that are included in the Contract Documents are the present expectations of the County for the period of the Contract; and the County is under no obligation to buy that or any amount as a result of having provided this estimate or of having had any normal or otherwise measurable requirement in the past. The County may require more goods and/or services than the estimated annual quantities, and any such additional quantities will not give rise to any claim for compensation other than at the unit prices and/or rates in the Contract.

The County does not guarantee that the Contractor will be the exclusive provider of the goods or services covered by this Contract. The items or services covered by this Contract may be or become available under other County contract(s), and the County may determine that it is in its best interest to procure the items or services through those contract(s).

**15. COUNTY PURCHASE ORDER REQUIREMENT**

County purchases are authorized only if the County issues a Purchase Order in advance of the transaction, indicating that the ordering County agency has sufficient funds available to pay for the purchase. If the Contractor provides goods or services without a signed County Purchase Order, it does so at its own risk

and expense. The County will not be liable for payment for any purchases made by its employees that are not authorized by the County Purchasing Agent.

**16. LIEN**

It is expressly agreed that after any payment has been made by the County either to the Contractor for work done, or labor or material supplied under the Contract, the County will have a lien upon all material delivered to the site either by the Contractor, or for the Contractor, which is to be used in the performance of the Contract.

**17. EMPLOYMENT DISCRIMINATION BY CONTRACTOR PROHIBITED**

During the performance of its work pursuant to this Contract:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, sexual orientation, gender identity, national origin, age, disability or on any other basis prohibited by state law. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

B. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation will be deemed sufficient for meeting the requirements of this section.

C. The Contractor will state in all solicitations or advertisements for employees that it places or causes to be placed that such Contractor is an Equal Opportunity Employer.

D. The Contractor will comply with the provisions of the Americans with Disabilities Act of 1990 ("ADA"), which prohibits discrimination against individuals with disabilities in employment and mandates that disabled individuals be provided access to publicly and privately provided services and activities.

E. The Contractor must include the provisions of the foregoing paragraphs in every subcontract or purchase order of more than $10,000.00 relating to this Contract so that the provisions will be binding upon each subcontractor or vendor.

**18. EMPLOYMENT OF UNAUTHORIZED ALIENS PROHIBITED**

In accordance with §2.2-4311.1 of the Code of Virginia, as amended, the Contractor must not during the performance of this Contract knowingly employ an unauthorized alien, as that term is defined in the federal Immigration Reform and Control Act of 1986.

**19. DRUG-FREE WORKPLACE TO BE MAINTAINED BY CONTRACTOR**

During the performance of this Contract, the Contractor must: (i) provide a drug-free workplace for its employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the Contractor's workplace and specifying the actions that will be taken against employees for violating such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the Contractor that the Contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of more than $10,000.00 relating to this Contract so that the provisions will be binding upon each subcontractor or vendor.

For the purposes of this section, "workplace" means the site(s) for the performance of the work required by this Contract.

**20. SEXUAL HARASSMENT POLICY**

If the Contractor employs more than five employees, the Contractor shall (i) provide annual training on the Contractor's sexual harassment policy to all supervisors and employees providing services in the Commonwealth, except such supervisors or employees that are required to complete sexual harassment training provided by the Department of Human Resource Management, and (ii) post the Contractor's sexual harassment policy in (a) a conspicuous public place in each building located in the Commonwealth that the Contractor owns or leases for business purposes and (b) the Contractor's employee handbook.

**21. PROJECT STAFF**

The County has the right to reasonably reject staff or subcontractors whom the Contractor assigns to the Project. The Contractor must then provide replacement staff or subcontractors satisfactory to the County in a timely manner and at no additional cost to the County. The day-to-day supervision and control of the Contractor's employees and its subcontractors is the sole responsibility of the Contractor.

**22. FAILURE TO DELIVER**

If the Contractor fails to deliver goods or services in accordance with the Contract terms and conditions, the County, after notice to the Contractor, may procure the goods or services from other sources and hold the Contractor responsible for any resulting additional purchase and administrative costs. The County shall be entitled to offset such costs against any sums owed by the County to the Contractor. However, if public necessity requires the use of nonconforming materials or supplies, they may be accepted at a reduction in price to be determined solely by the County.

**23. UNSATISFACTORY WORK**

If any of the work done, or material, goods, or equipment provided by the Contractor, is unsatisfactory to the County the Contractor must, upon notice from the County, immediately remove at the Contractor's expense such unsatisfactory work, material, goods, or equipment and replace the same with work, material, goods, or equipment satisfactory to the County. If the Contractor fails to do so after fifteen (15) days the County shall have the right to remove or replace the rejected work, material, goods, or equipment at the expense of the Contractor and offset the expense and administrative costs against any sums owed to the Contractor. This provision applies during the Contract term and during any warranty or guarantee period. At the Project Officer’s discretion, rather than correction or replacement of the work, an appropriate adjustment to the Contract Amount may be made.

**24. TERMINATION**

The County may terminate this Contract at any time as follows: (1) for cause, if, as determined by the County, the Contractor is in breach or default or has failed to perform the Work satisfactorily; or (2) for the convenience of the County.

Upon receipt of a notice of termination, the Contractor must not place any further orders or subcontracts for materials, services or facilities; must terminate all vendors and subcontracts, except as are necessary for the completion of any portion of the Work that the County did not terminate; and must immediately deliver all documents related to the terminated Work to the County.

Any purchases that the Contractor makes after the notice of termination will be the sole responsibility of the Contractor, unless the County has approved the purchases in writing as necessary for completion of any portion of the Work that the County did not terminate.

If any court of competent jurisdiction finds a termination for cause by the County to be improper, then the termination will be deemed a termination for convenience.

A. TERMINATION FOR CAUSE, INCLUDING BREACH AND DEFAULT; CURE

1. Termination for Unsatisfactory Performance. If the County determines that the Contractor has failed to perform satisfactorily, then the County will give the Contractor written notice of such failure(s) and the opportunity to cure them within 15 days or any other period specified by the County ("Cure Period"). If the Contractor fails to cure within the Cure Period, the County may terminate the Contract for failure to provide satisfactory performance by providing written notice with a termination date. Upon such termination, the Contractor may apply for compensation for Contract services that the County previously accepted ("Termination Costs"), unless payment is otherwise barred by the Contract. The Contractor must submit any request for Termination Costs, with all supporting documentation, to the County Project Officer within 30 days after the expiration of the Cure Period. The County may accept or reject the request for Termination Costs, in whole or in part, and may notify the Contractor of its decision within a reasonable time.

   In the event of termination by the County for failure to perform satisfactorily, the Contractor must continue to provide its services as previously scheduled through the termination date, and the County must continue to pay all fees and charges incurred through the termination date.

2. Termination for Breach or Default. If the County terminates the Contract for default or breach of any Contract provision or condition, then the termination will be immediate after notice of termination to the Contractor (unless the County provides for an opportunity to cure), and the Contractor will not be permitted to seek Termination Costs.

   Upon any termination pursuant to this section, the Contractor will be liable to the County for costs that the County must expend to complete the Work, including costs resulting from any related delays and from unsatisfactory or non-compliant work performed by the Contractor or its subcontractors. The County will deduct such costs from any amount due to the Contractor; or if the County does not owe the Contractor, the Contractor must promptly pay the costs within 15 days of a demand by the County. This section does not limit the County's recovery of any other damages to which it is entitled by law.
   Except as otherwise directed by the County, the Contractor must stop work on the date of receipt the notice of the termination.

B. TERMINATION FOR THE CONVENIENCE OF THE COUNTY

The County may terminate this Contract in whole or in part whenever the Purchasing Agent determines that termination is in the County's best interest. The County will give the Contractor at least 15 days' notice in writing. The notice must specify the extent to which the Contract is terminated and the effective termination date. The Contractor will be entitled to Termination Costs, as defined above, plus any other reasonable amounts that the parties might negotiate; but no amount will be allowed for anticipatory profits.

Except as otherwise directed by the County, the Contractor must stop work on the date of receipt of the notice of the termination.

**25. INDEMNIFICATION**

The Contractor covenants for itself, its employees and its subcontractors to save, defend, hold harmless and indemnify the County and all of its elected and appointed officials, officers, current and former employees, agents, departments, agencies, boards and commissions (collectively the "County Indemnitees") from and against any and all claims made by third parties for any and all losses, damages, injuries, fines, penalties, costs (including court costs and attorneys' fees), charges, liability, demands or exposure resulting from, arising out of or in any way connected with the Contractor's acts or omissions, including the acts or omissions of its employees, vendors, delivery drivers and/or subcontractors, in performance or nonperformance of the Contract. This duty to save, defend, hold harmless and indemnify will survive the termination of this Contract. If the Contractor fails or refuses to fulfill its obligations contained in this section, the Contractor must reimburse the County for any and all resulting payments and expenses, including reasonable attorneys' fees. The Contractor must pay such expenses upon demand by the County, and failure to do so may result in the County withholding such amounts from any payments to the Contractor under this Contract.

**26. INTELLECTUAL PROPERTY INDEMNIFICATION**

The Contractor warrants and guarantees that in providing services under this Contract neither the Contractor nor any subcontractor is infringing on the intellectual property rights (including, but not limited to, copyright, patent, mask and trademark) of third parties.

If the Contractor or any of its employees or subcontractors uses any design, device, work or material that is covered by patent or copyright, it is understood that the Contract Amount includes all royalties, licensing fees, and any other costs arising from such use in connection with the Work under this Contract.
The Contractor covenants for itself, its employees and its subcontractors to save, defend, hold harmless, and indemnify the County Indemnitees, as defined above, from and against any and all claims, losses, damages, injuries, fines, penalties, costs (including court costs and attorneys' fees), charges, liability or exposure for infringement of or on account of any trademark, copyright, patented or unpatented invention, process or article manufactured or used in the performance of this Contract. This duty to save, defend, hold harmless and indemnify will survive the termination of this Contract. If the Contractor fails or refuses to fulfill its obligations contained in this section, the Contractor must reimburse the County for any and all resulting payments and expenses, including reasonable attorneys' fees. The Contractor must pay such expenses upon demand by the County, and failure to do so may result in the County withholding such amounts from any payments to the Contractor under this Contract.

**27. COPYRIGHT**

By this Contract, the Contractor irrevocably transfers, assigns, sets over and conveys to the County all rights, title and interest, including the sole exclusive and complete copyright interest, in any and all copyrightable works created pursuant to this Contract. The Contractor will execute any documents that the County requests to formalize such transfer or assignment.

The rights granted to the County by this section are irrevocable and may not be rescinded or modified, including in connection with or as a result of the termination of or a dispute concerning this Contract.

The Contractor may not use subcontractors or third parties to develop or provide input into any copyrightable materials produced pursuant to this Contract without the County's advance written

approval and unless the Contractor includes this Copyright provision in any contract or agreement with such subcontractors or third parties related to this Contract.

**28. OWNERSHIP AND RETURN OF RECORDS**

This Contract does not confer on the Contractor any ownership rights or rights to use or disclose the County's data or inputs.

All drawings, specifications, blueprints, data, information, findings, memoranda, correspondence, documents or records of any type, whether written, oral or electronic, and all documents generated by the Contractor or its subcontractors as a result of this Contract (collectively "Records") are the exclusive property of the County and must be provided or returned to the County upon completion, termination, or cancellation of this Contract. The Contractor will not use or willingly cause or allow such materials to be used for any purpose other than performance of this Contract without the written consent of the County.

The Records are confidential, and the Contractor will neither release the Records nor share their contents. The Contractor will refer all inquiries regarding the status of any Record to the Project Officer or to his or her designee. At the County's request, the Contractor will deliver all Records, including hard copies of electronic records, to the Project Officer and will destroy all electronic Records.

The Contractor agrees to include the provisions of this section as part of any contract or agreement related to this Contract into which it enters with subcontractors or other third parties.

The provisions of this section will survive any termination or cancellation of this Contract.

**29. CONFIDENTIAL INFORMATION**

The Contractor and its employees, agents and subcontractors will hold as confidential all County information obtained under this Contract. Confidential information includes, but is not limited to, nonpublic personal information; personal health information (PHI); social security numbers; addresses; dates of birth; other contact information or medical information about a person; and information pertaining to products, operations, systems, customers, prospective customers, techniques, intentions, processes, plans and expertise. The Contractor must take reasonable measures to ensure that all of its employees, agents and subcontractors are informed of and abide by this requirement.

**30. ETHICS IN PUBLIC CONTRACTING**

This Contract incorporates by reference Article 9 of the Arlington County Purchasing Resolution, as well as all state and federal laws related to ethics, conflicts of interest or bribery, including the State and Local Government Conflict of Interests Act (Code of Virginia § 2.2-3100 et seq.), the Virginia Governmental Frauds Act (Code of Virginia § 18.2-498.1 et seq.) and Articles 2 and 3 of Chapter 10 of Title 18.2 of the Code of Virginia, as amended (§ 18.2-438 et seq.). The Contractor certifies that its bid was made without collusion or fraud; that it has not offered or received any kickbacks or inducements from any other offeror, supplier, manufacturer or subcontractor; and that it has not conferred on any public employee having official responsibility for this procurement any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value was exchanged.

## 31. COUNTY EMPLOYEES

No Arlington County employee may share in any part of this Contract or receive any benefit from the Contract that is not available to the general public.

## 32. FORCE MAJEURE

Neither party will be held responsible for failure to perform the duties and responsibilities imposed by this Contract if such failure is due to a fire, riot, rebellion, natural disaster, war, act of terrorism or act of God that is beyond the control of the party and that makes performance impossible or illegal, unless otherwise specified in the Contract, provided that the affected party gives notice to the other party as soon as practicable after the force majeure event, including reasonable detail and the expected duration of the event's effect on the party.

## 33. AUTHORITY TO TRANSACT BUSINESS

The Contractor must, pursuant to Code of Virginia § 2.2-4311.2, be and remain authorized to transact business in the Commonwealth of Virginia during the entire term of this Contract. Otherwise, the Contract is voidable at the sole option of and with no expense to the County.

## 34. RELATION TO THE COUNTY

The Contractor is an independent contractor, and neither the Contractor nor its employees or subcontractors will be considered employees, servants or agents of the County. The County will not be responsible for any negligence or other wrongdoing by the Contractor or its employees, servants or agents. The County will not withhold payments to the Contractor for any federal or state unemployment taxes, federal or state income taxes or Social Security tax or for any other benefits. The County will not provide to the Contractor any insurance coverage or other benefits, including workers' compensation.

## 35. ANTITRUST

The Contractor conveys, sells, assigns and transfers to the County all rights, title and interest in and to all causes of action under state or federal antitrust laws that the Contractor may have relating to this Contract.

## 36. REPORT STANDARDS

The Contractor must submit all written reports required by this Contract for advance review in a format approved by the Project Officer. Reports must be accurate and grammatically correct and should not contain spelling errors. The Contractor will bear the cost of correcting grammatical or spelling errors and inaccurate report data and of other revisions that are required to bring the report(s) into compliance with this section.

Whenever possible, proposals must comply with the following guidelines:

- printed double-sided on at least 30% recycled-content and/or tree-free paper
- recyclable and/or easily removable covers or binders made from recycled materials (proposals with glued bindings that meet all other requirements are acceptable)
- avoid use of plastic covers or dividers
- avoid unnecessary attachments or documents or superfluous use of paper (e.g. separate title sheets or chapter dividers)

## 37. AUDIT

The Contractor must retain all books, records and other documents related to this Contract for at least five (5) years, unless otherwise specified in the Contract, or such period of time required by the County's funding partner(s), if any, whichever is greater, after the final payment and must allow the County or its authorized agents to examine the documents during this period and during the Contract Term. The Contractor must provide any requested documents to the County for examination within 15 days of the request, at the Contractor's expense. Should the County's examination reveal any overcharging by the Contractor, the Contractor must, within 30 days of County's request, reimburse the County for the overcharges and for the reasonable costs of the County's examination, including, but not limited to, the services of external audit firm and attorney's fees; or the County may deduct the overcharges and examination costs from any amount that the County owes to the Contractor. If the Contractor wishes to destroy or dispose of any records related to this Contract (including confidential records to which the County does not have ready access) within five (5) years after the final payment, unless otherwise specified in the Contract, or such period of time required by the County's funding partner(s), if any, whichever is greater, the Contractor must give the County at least 30 days' notice and must not dispose of the documents if the County objects.

The Purchasing Agent may require the Contractor to demonstrate that it has the necessary facilities, ability, and financial resources to comply with the Contract and furnish the service, material or goods specified herein in a satisfactory manner at any time during the term of this Contract.

## 38. ASSIGNMENT

The Contractor may not assign, transfer, convey or otherwise dispose of any award or any of its rights, obligations or interests under this Contract without the prior written consent of the County.

## 39. AMENDMENTS

This Contract may not be modified except by written amendment executed by persons duly authorized to bind the Contractor and the County.

## 40. ARLINGTON COUNTY PURCHASING RESOLUTION AND COUNTY POLICIES

Nothing in this Contract waives any provision of the Arlington County Purchasing Resolution, which is incorporated herein by reference, or any applicable County policy.

## 41. DISPUTE RESOLUTION

All disputes arising under this Agreement or concerning its interpretation, whether involving law or fact and including but not limited to claims for additional work, compensation or time, and all claims for alleged breach of contract must be submitted in writing to the Project Officer as soon as the basis for the claim arises. In accordance with the Arlington County Purchasing Resolution, claims denied by the Project Officer may be submitted to the County Manager in writing no later than 60 days after the final payment. The time limit for a final written decision by the County Manager is 30 days. Procedures concerning contractual claims, disputes, administrative appeals and protests are contained in the Arlington County Purchasing Resolution. The Contractor must continue to work as scheduled pending a decision of the Project Officer, County Manager, County Board or a court of law.

## 42. APPLICABLE LAW, FORUM, VENUE, AND JURISDICTION

This Contract is governed in all respects by the laws of the Commonwealth of Virginia; and the jurisdiction, forum and venue for any litigation concerning the Contract or the Work is in the Circuit Court for Arlington County, Virginia, and in no other court.

**43. ARBITRATION**

No claim arising under or related to this Contract may be subject to arbitration.

**44. NONEXCLUSIVITY OF REMEDIES**

All remedies available to the County under this Contract are cumulative, and no remedy will be exclusive of any other at law or in equity.

**45. NO WAIVER**

The failure to exercise a right provided for in this Contract will not be a subsequent waiver of the same right or of any other right.

**46. SEVERABILITY**

The sections, paragraphs, clauses, sentences, and phrases of this Contract are severable; and if any section, paragraph, clause, sentence or phrase of this Contract is declared invalid by a court of competent jurisdiction, the rest of the Contract will remain in effect.

**47. ATTORNEY'S FEES**

In the event that the County prevails in any legal action or proceeding brought by the County to enforce any provision of this Contract, the Contractor will pay the County's reasonable attorney's fees and expenses.

**48. SURVIVAL OF TERMS**

In addition to any statement that a specific term or paragraph survives the expiration or termination of this Contract, the following sections also survive: INDEMNIFICATION; INTELLECTUAL PROPERTY INDEMNIFICATION; RELATION TO COUNTY; OWNERSHIP AND RETURN OF RECORDS; AUDIT; COPYRIGHT; DISPUTE RESOLUTION; APPLICABLE LAW AND JURISDICTION; ATTORNEY'S FEES, AND CONFIDENTIAL INFORMATION.

**49. HEADINGS**

The section headings in this Contract are inserted only for convenience and do not affect the substance of the Contract or limit the sections' scope.

**50. AMBIGUITIES**

The parties and their counsel have participated fully in the drafting of this Agreement; and any rule that ambiguities are to be resolved against the drafting party does not apply. The language in this Agreement is to be interpreted as to its plain meaning and not strictly for or against any party.

**51. NOTICES**

Unless otherwise provided in writing, all legal notices and other formal communications required by this Contract are deemed to have been given when either (a) delivered in person; (b) delivered by an agent, such as a delivery service; or (c) deposited in the United States mail, postage prepaid, certified or registered and addressed as follows:

**TO THE CONTRACTOR**:

_____

_____

_____

_____

**TO THE COUNTY**:

_____, Project Officer
_____
_____
_____

AND

Dr. Sharon T. Lewis, LL.M, MPS, VCO, CPPB
Purchasing Agent
Arlington County, Virginia
2100 Clarendon Boulevard, Suite 500
Arlington, Virginia 22201
Phone: (703) 228-3294
Email: slewis1@arlingtonva.us

**TO COUNTY MANAGER'S OFFICE (FOR PROJECT CLAIMS):**

Mark Schwartz, County Manager
Arlington County, Virginia
2100 Clarendon Boulevard, Suite 318
Arlington, Virginia 22201

**52. NON-DISCRIMINATION NOTICE**

Arlington County does not discriminate against faith-based organizations.

**53. INSURANCE, PAYMENT AND PERFORMANCE BONDS**

The Contractor shall maintain the required insurance coverage and payment and performance bonds as set forth in the Invitation to Bid through completion of the Contract, including all warranty and guarantee periods.

**54. MATERIAL CHANGES**

The Contractor shall notify Purchasing Agent within seven days of any material changes in its operation that relate to any matter attested regarding certifications on its bid form.

**55. CONTRACTOR PERFORMANCE EVALUATION**

Arlington County will perform written evaluations of the Contractor's performance at various intervals throughout the term of this Contract. The evaluations will address, at a minimum, the Contractor's work/performance, quality, cost controls, schedule, timeliness and sub-contractor management. The Project Officer shall be responsible for completing the evaluations and providing a copy to the Contractor and County Procurement Officer.

**56. COUNTERPARTS**

This Agreement may be executed in one or more counterparts and all of such counterparts shall together constitute one and the same instrument. Original signatures transmitted and received via facsimile or

other electronic transmission (e.g., PDF or similar format) are true and valid signatures for all purposes hereunder and shall be effective as delivery of a manually executed original counterpart.

WITNESS these signatures:

| THE COUNTY BOARD OF ARLINGTON COUNTY, VIRGINIA | CONTRACTOR |
|---|---|
| AUTHORIZED SIGNATURE: _____ | AUTHORIZED SIGNATURE: _____ |
| NAME: _____ | NAME: _____ |
| TITLE: _____ | TITLE: _____ |
| DATE:_____ | DATE: _____ |

## III. ARLINGTON COUNTY CONSTRUCTION GENERAL CONDITIONS

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## A. INTRODUCTION TO TERMS

1) The term "Agreement" means the completed and signed Form of Contract Agreement.

2) The term “Award Date” means the date of execution of the Agreement by the Purchasing Agent.

3) The term “Business Day” shall refer to any day that the County is open for general business.

4) The term “Calendar Day” means any day of twenty-four hours measured from midnight to the next midnight. Included are weekends and holidays. When the term “Day” is used it shall be assumed to refer to a Calendar Day unless otherwise specified.

5) The term “Change Order” means a written order to the Contractor, signed by the Project Officer and the Contractor, which authorizes a change in the Work, and/or adjustment to the Contract Amount and/or an adjustment to the Time for Completion. A Change Order once signed by all the parties is incorporated into and becomes part of the Contract.

6) The term "Commencement Date" means the date on which the Time for Completion will commence for the Contractor to begin to perform his obligations under the Contract Documents as provided in the Notice to Proceed.

7) The term “Construction Change Directive” means a written order issued by the County directing a change in the Work prior to agreement on adjustment, if any, in the Contract Amount or Contract Time, or both.

8) The term "Contract Documents" means the Agreement and all the documents and Exhibits and/or Attachments identified therein which shall include the Drawings and the Specifications, and all modifications including amendments and subsequent Change Orders thereto properly incorporated in the Contract.

9) The terms "County" and "Contractor" shall mean the respective parties to the Contract. They shall be treated throughout the Contract Documents as though each were of the singular number and masculine gender. Only one Contractor is recognized as a party to this Contract.

10) The term “Critical Path Method or CPM” means a step-by-step project management technique for process planning that defines critical and non-critical tasks with the goal of preventing time-frame problems and process bottlenecks. An activity on the critical path cannot be started until its predecessor activity has been completed.is delayed then the entire project is delayed.

11) The term “Delay” means an event or condition that results in a work activity starting or being completed later than originally planned.

12) The term "Drawings" means all drawings pertaining to the Contract, including the Contract Drawings and Construction Notes which show and describe the locations, character, dimensions, and details of the Work to be performed under the contract.

13) The term “Field Order” is a written order to the Contractor, authorized by the Project Officer, which acknowledges a change in the Work that does not adjust the Contract Amount and does not adjust the Time for Completion.

14) The term “Final Acceptance” shall mean the date on which the County issues the final payment for the Work.

15) The term “Final Completion” shall mean the condition when the County agrees that all the Work has been fully completed in accordance with the Contract Documents and is acceptable. The date of the Final Completion of the Work under the Contract is the date on which Final Completion is accomplished.

16) The term “Float” shall represent the amount of time that a task in a project network or sequence can be delayed without causing a delay to: subsequent tasks ("free Float") or project completion date ("total Float"). Float shall belong to the County and shall be used for the successful completion of the Project within the Time for Completion.

17) The term “Limits of Disturbance (LOD)" shall represent the area within which land disturbing activities take place. Land disturbing activities include all actions that expose bare soil during construction.

18) The term “Limits of Work (LOW)" shall represent the area within which construction activities take place, including but not limited to the Limits of Disturbance area.

19) The term “Notice to Proceed” shall mean a written notice issued by the County to the Contractor stating the Commencement Date. The Notice to Proceed will specify the Time for Completion of the Contract.

20) The term “Project” means the entire proposed construction to be executed as stipulated in the Contract Documents

21) The term "Project Officer" means the County Project Officer assigned by the Director of the County Department responsible for the project, or the Director’s designee. When a designee to act on behalf of the Project Officer is used by the County, the name of the designee and the duties and authority of such designee will be identified in the Contract Documents or in a written notice to the Contractor from the Project Officer responsible for the project. The designee may be a professional architect or engineer or other person employed by the County to perform construction services administration, design services, or project oversight.

22) The term “Punch List” means unfinished items of the construction of the Project, which unfinished items of construction are minor or insubstantial details of construction, mechanical adjustment or decoration remaining to be performed, the non-completion of which would not materially affect use of the Project, and which are capable of being completed within the time specified for Final Completion after Substantial Completion has been achieved.

23) The term “Request for Information” (RFI) means a request originated by the Contractor requesting clarification or additional information from the Project Officer and/or Architect/Engineer concerning information in the construction documents where the Contractor believes there is insufficient information or a conflict in the documents. RFI’s shall be submitted by the Contractor sufficiently in advance of the Work to provide time for assessment and response without delay of the Work. Reponses to RFI’s shall not be construed as authorization for a Change Order.

24) The term “Schedule of Values” means a listing of the Contractor’s total contract value by Construction Specifications Institute (CSI) divisions, including Division 1, Contractor’s General Conditions.

25) The term “Site” refers to that portion of the property on which the Work is to be performed or which has otherwise been set aside for use by the Contractor.

26) The terms "Special Conditions" mean the written statements modifying or supplementing the Technical Specifications or General Conditions for requirements or conditions peculiar to the Contract.

27) The term "Specifications" means and shall include the Technical Specifications, the Special Conditions and all written agreements and instructions pertaining to the performance of the Work.

28) When used, the term “Stipulated Price Item” means and includes an item of Work, unanticipated or of unknown quantity at the time of issuance of the solicitation for a Bid and determined to be executed, based on the actual field conditions during the progress of Work under the Contract. The Unit Price for the “Stipulated Price Item”, as identified in the “Stipulated Price Items” section of the Bid Form, is predetermined by the County as the current reasonably workable rate for the Item inclusive of all necessary labor, equipment, materials, overheads (provision and installation), and the contractor’s profit.

29) The term "Subcontractor", shall include only those having a direct contract with the Contractor, and it shall include those who furnish material worked to a special design according to the plans and specifications for this Work but shall not include those who merely furnish material not so worked.

30) The term “Substantial Completion” shall mean the condition when the County agrees that the Work, or a specific portion thereof, is sufficiently complete, in accordance with the Contract Documents, so that it can be utilized by the County for the purposes for which it was intended. The date of Substantial Completion of the Work under the Contract is the milestone date on which Substantial Completion condition is accomplished.

31) The term "Technical Specifications" means that part of the Contract Documents that describe the quality of materials, method of installation, standard of workmanship, and the administrative and procedural requirements for the performance of the Work under the contract.

32) The term “Time for Completion” shall mean the time period set forth in the Agreement.

33) The term "Work" shall mean the services performed under this Contract including, but not limited to, furnishing labor, and furnishing and installing materials and equipment required to complete the Project specified in the Contract Documents.

## B. DRAWINGS, SPECIFICATIONS, RELATED DATA AND RECORDS KEEPING

### 1. INTENT OF THE DRAWINGS AND SPECIFICATIONS

a. It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, water haulage, light power, transportation, superintendence, temporary construction of all kinds, and other services and facilities of every nature whatsoever that are necessary to execute and deliver the Work, complete and usable within the scope of the Contract with all parts in working order, and all connections properly made.

b. The general character and scope of the Work are illustrated by the Drawings and listed in the Specifications. Any additional drawings and or other instructions deemed necessary by the Project Officer or designee will be furnished to the Contractor when required for the Work and shall be incorporated into the Contract Documents.

c. Where “as shown”, “as indicated”, “as detailed”, or words of similar import are used, it shall be understood that direction, requirements, permission, or review of Project Officer or designee is intended unless stated otherwise. As used herein, “provide” shall be understood to mean “provide complete in place”, that is, “furnish and install.”

d. Unless otherwise specifically noted, the word "similar" where it occurs in the Drawings, shall be interpreted in its general sense and not as meaning identical, and all details shall be worked out in relation to their locations and their connection with other parts of the Work.

e. Materials or work described in words which, so applied, have a well-known technical, construction industry, or trade meaning, shall be held to refer to the recognized technical or trade meaning.

f. The Contract Documents are complementary, and what is called for by any one document shall be as binding as if called for by all documents. In case of conflicting variance between the Contract Documents, the Order of Precedence stated in the Agreement shall govern. Figured dimensions on the plans shall be used; drawings shall not be scaled.

g. Unless otherwise specifically noted, construction tolerances shall be to the numerical precision presented in the Contract Drawings.

### 2. DISCREPANCIES AND ERRORS

If the Contractor discovers any discrepancies between the Drawings and Specifications and the site conditions or any errors or omissions in the Drawings or Specifications, the Contractor shall at once, but in no event later than three calendar days after discovery of

the discrepancy or error, report them in writing to the Project Officer or designee. If the Contractor proceeds with any work that may be affected by such discrepancies, errors, or omissions, after their discovery, but before a clarification is provided, such work shall be at the Contractor's risk and expense. Issues affecting critical path activities shall be made known to the Project Officer or designee within one business day after discovery.

3. DIFFERING SITE CONDITIONS

The Contractor shall immediately, and before the conditions are further disturbed, give notice to the Project Officer of subsurface or latent physical conditions at the site which differ materially from those indicated in this Contract, or previously unknown physical conditions discovered at the site of an unusual nature and which differ materially from those ordinarily expected to be encountered at the site. Such notice shall be followed by a written notice provided within 48 hours of discovery.

The Project Officer will investigate the site conditions promptly after receiving the notice. If the conditions do materially differ to the extent that an increase or decrease would result in the Contractor's cost of the Work, or the time required for performing any part of the Work under the contract, an equitable adjustment may be made under this clause and the Contract modified in writing accordingly.

No request by the Contractor for an adjustment to the Contract under this clause shall be allowed, unless the Contractor has given the written notice required. If the Contractor proceeds with any work that may be affected by such differing site conditions before giving notice to the Project Officer as set forth herein, such work shall be at the Contractor’s sole risk and expense.

No request by the Contractor for an adjustment to the contract for differing site conditions shall be allowed if made after Final Payment under the Contract.

4. COPIES FURNISHED

Except as provided for otherwise, copies of the Drawings and Specifications reasonably necessary for the execution of the Work will be furnished to the Contractor. One electronic copy of the Contract Drawings and Specifications will be provided by the Project Officer or designee to the Contractor.

5. USE OF CADD FILES

The Contractor may request Electronic CADD files related to the Work or the Project. The CADD files will be provided by the County only if the Contractor completes the Arlington County Electronic CADD Drawing Release Form, which form is then incorporated by reference into this Contract. Use of CADD files is at the Contractor’s own risk and in no way alleviates Contractor’s responsibility for the Work to conform to the Plans and Specifications.

6. DOCUMENTS ON THE JOBSITE

The Contractor shall keep on the site of the Project a copy of the Drawings and Specifications updated to include all authorized revisions and RFI responses, and shall at all times give the County and its authorized representatives access thereto. The Contractor shall mark up the Drawings on a daily basis in red. The As-Built Drawings shall be submitted to the County at Substantial Completion as the Final As-Built Drawings.

7. OWNERSHIP OF DRAWINGS AND SPECIFICATIONS

All Drawings and Specifications and copies thereof furnished by the County are the property of the County and shall not be used on other projects. All copies of the Drawings and Specifications except the signed Contract sets shall be returned to the Project Officer or designee at Final Completion.

8. SUBMITTALS

a. The term "submittals", as used herein, shall include fabrications, erection and setting drawings, manufacturers' standard drawings, schedules, descriptive literature, catalogs, brochures, performance and test data, wiring and control diagrams, and other descriptive data pertaining to the materials and equipment as required to demonstrate compliance with the Contract requirements.

b. Unless other specified in the Specifications the Contractor shall submit for the review of the Project Officer or designee a listing of all submittals required by the Specifications or requested by the Project Officer or designee within fifteen (15) calendar days after receipt of the Notice to Proceed. This listing shall include due dates for each required submittal, coordinated with the project schedule such that adequate time is allotted for review and potential resubmittals, fabrication and delivery without causing delay. The Contractor bears all risk for delay associated with submittals not received in a timely manner.

c. Submittals shall be submitted in such number of copies as established in the Specifications. Each submission shall be accompanied by a letter of transmittal, listing the contents of the submission and identifying each item by reference to specification section or drawing. All submittals shall be clearly labeled with the name of the project and such information as may be necessary to enable their complete review by the Project Officer or designee. Catalog plates and other similar material that cannot be so labeled conveniently shall be bound in suitable covers bearing the identifying data.

d. Submittals shall be accompanied by all required certifications and other such supporting material, and shall be submitted in sequence or groups that all related items can be checked together. When submittals cannot

be checked because a submission is not complete, or because submittals on related items have not been received by the Project Officer or designee, then such submittals will be returned without action or will be held, not checked, until the missing material is received. Incomplete or defective submittals shall not be considered to have been submitted. Failure to deliver submittals within the specified time will not be grounds for additional time or compensation.

e. Submittals shall have been reviewed by the Contractor and coordinated with all other related or affected work before they are submitted for review and acceptance and shall bear the Contractor's certification that the Contractor has checked and approved them as complying with all relevant information in the Contract Documents. Submittals submitted without such certification and coordination will be returned to the Contractor without action and will not be considered as a formal submission.

f. If shop drawings show variations from the Drawings and Specifications because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in the Contractor's letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment; otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the Drawings and Specifications even though shop drawings have been accepted.

g. The Project Officer or designee shall review the shop drawings with reasonable promptness. Review and/or acceptance of shop drawings will be general for conformance with the design concept of the Project and compliance with the information given in the Contract Documents, and will not include quantities, detailed dimensions, nor adjustments of dimensions to actual field conditions. Acceptance shall not be construed as permitting any departure from Contract requirements, as authorization of any increase in price nor as relieving the Contractor of the responsibility for any error in details, dimensions or otherwise that may exist. Review is not intended to relieve the contractor of full responsibility for the accuracy and completeness of the plans and calculations, or for the complete compliance with the contract documents. Contractor is solely responsible for the means and methods of the construction, including temporary items proposed for use.

9. SAMPLES

The Contractor shall submit to the Project Officer or designee, all samples required by the Specifications or requested by the Project Officer or designee. Samples shall be submitted in single units only, unless the Contractor desires additional units for the Contractor's own use. Each sample shall bear a label indicating what the material represented, the name of the producer and the title of the Project. Acceptance of a sample shall be only for conformance with the design concept of the Project and compliance with the information given in

the Contract Documents, and only for the characteristics or use named in such acceptance. Such acceptance shall not be construed to change or modify any Contract requirements or the Contract Price. Materials and equipment incorporated in the Work shall match the accepted samples. The Contractor shall be responsible for researching the availability of the specified product in the dimensions and colors specified at no additional cost to the County. Failure of the Contractor to identify specified products that are not commercially produced within the time required for submittal transmittal in order to meet the project schedule shall not be entitled to additional time or compensation.

10. TESTS

Any specified tests of materials and finished articles shall be made by bureaus, laboratories or agencies approved by the Project Officer or designee and the certified reports of such tests shall be submitted to the Project Officer or designee. All tests shall be in compliance with the Specifications. All costs in connection with the testing and test failures shall be borne by the Contractor. Failure of any material to pass the specified tests or any test performed by the Project Officer or designee, will be sufficient cause for refusal to consider, under this Contract, any further materials of the same brand or make of that material. Samples of various materials delivered on the site or in place may be taken by the Project Officer or designee for testing. Samples failing to meet the Contract requirements will automatically void previous acceptance of the items tested. The Contractor will not be compensated for additional time and/or cost incurred in finding an acceptable replacement or the removal and replacement of the defective item.

11. MATERIALS AND EQUIPMENT LIST

a. Unless otherwise specified in the Specifications, within thirty (30) days of the Commencement Date the Contractor shall submit to the Project Officer or designee a complete list of materials and equipment proposed for use in connection with the Project. Partial lists submitted from time to time will not be considered unless specifically approved by the Project Officer or designee.

b. After any material or piece of equipment has been approved through submittal process, no change in brand or make will be permitted unless satisfactory written evidence is presented to prove that the manufacturer cannot make scheduled delivery of the accepted material, or that material delivered has been rejected and the substitution of a suitable material is an urgent necessity, or that other conditions have become apparent which indicate that acceptance of such other material is in the best interest of the County. The Contractor is solely responsible for the cost and time required to obtain and install a suitable replacement.

12. STANDARDS, SUBSTITUTIONS

a. Any material specified by reference to the number, symbol or title of a specific standard, such as a Commercial Standard, a Federal Specification, a Trade Association Standard, or other similar standard, shall comply with the requirements in the latest revision of the standards or specification and any amendment or supplement, except as limited to type, class or grade, or as modified in such reference. The standard referred to, except as modified in the Specifications, shall have full force and effect as though printed in the Specifications.

b. Reference in the Specifications or on the Drawings to any article, device, product, material, fixture, form or type of construction by name, make or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as eliminating from competition other products of equal or better quality by other approved manufacturers. Otherwise, applications for acceptance of substitutions for the specified items will be considered only upon request of the Contractor, not of individuals, trades or suppliers, and only for a specific purpose; no blanket acceptance will be granted. No acceptance of a substitution shall be valid unless it is in written form and signed by the Project Officer or designee.

c. If any proposed substitution will affect a correlated function, adjacent construction or the work of other contractors, then the necessary changes and modifications to the affected work shall be considered as an essential part of the proposed substitution, to be accomplished by the Contractor without additional expense to the County or an extension of the contract time, if and when accepted. Detail drawings and other information necessary to show and explain the proposed modifications shall be submitted with the request for acceptance of the substitution.

13. SURVEYS AND CONTROLS

Unless otherwise specified, the Contractor shall establish all baselines for the location of the principal component parts of the Work, establish a suitable number of benchmarks adjacent to the Work, and develop all detail surveys necessary for construction by a professional land surveyor licensed in the Commonwealth of Virginia. The Contractor shall carefully preserve benchmarks, reference points and stakes, and in the case of destruction thereof by the Contractor or due to the Contractor's negligence or the negligence of any subcontractor or supplier, the Contractor shall be responsible for expense and damage resulting therefrom and shall be responsible for any mistakes that may be caused by the loss or disturbance of such benchmarks, reference points and stakes. The Contractor shall within 30 days of NTP perform a full site survey to verify all control points shown on the drawings against existing conditions within the site limits. Any discrepancies found during this effort shall be made known immediately to the Project Officer. Failure to perform this survey and

provide proof and acceptance of Project datum, control points, and existing benchmarks will not give rise to any extensions to contract time or amount. The cost of all necessary surveying services shall be considered incidental to the work and, unless otherwise specified, shall be included in the cost of the Work.

14. AS-BUILT DRAWINGS

As-Built Drawings shall be the responsibility of the Contractor. The Contractor shall maintain and mark up one set of prints of the applicable Contract Drawings to portray as-built construction. The prints shall be neatly and clearly marked in red to show all variations between the Work actually provided and that indicated on the Contract Drawings, and all utilities encountered in the Work. All drafting shall conform to good drafting practice and shall include such supplementary notes, legends and details as may be necessary for legibility and clear portrayal of the as-built construction. These drawings shall be marked promptly upon any approved change to the Work or discovery of any undocumented utility or obstruction and shall be submitted to the Project Officer or designee in sufficient time to be approved no later than thirty (30) calendar days after the Substantial Completion Date. The final As-Built Drawings approved by the Project Officer or designee shall be submitted in paper copy and .pdf format electronic files prior to Final Completion. Unless otherwise required under the Contract Documents, incorporation of red-lined changes into CADD format shall be the responsibility of the Architect and/or Engineer of Record, with the exception being any documents prepared by the Contractor in CADD, the record version of which shall also be provided to the County in CADD format by the Contractor. Final payments will be held until the complete set of red-line drawings are submitted to and approved by the Project Officer.

15. WEB BASED RECORDS DOCUMENTATION

Unless instructed otherwise, the Contractor shall use the web based construction management tool, e-Builder for, but not limited to, submittals, record keeping and document storage of all construction files including, invoices, pay applications, RFIs, approved shop drawings, change orders, construction progress meeting minutes, warranties, equipment specifications and brochures, record drawings, automated alerts and reminders for all functions, and Operation and Maintenance (O&M) Manuals.

## C. COUNTY, COUNTY PROJECT OFFICER, AND CONTRACTOR RELATIONS

1. STATUS OF COUNTY PROJECT OFFICER OR DESIGNEE

The Project Officer or designee shall be the County's representative during the construction period. All Contractor instructions or requests shall be issued from or submitted through the Project Officer or designee. The Project Officer or designee shall have authority to suspend the Work whenever such suspension may be necessary in the responsible opinion of the Project Officer or designee to ensure the proper execution of the Contract. The Project Officer or designee shall also have authority to reject all work and materials that do not conform to the Contract and to decide questions that arise in the execution of the Work. The County Project Officer or designee will, within a reasonable time, make decisions on all matters relating to the execution and progress of the Work.

2. LIMITATION ON COUNTY'S RESPONSIBILITIES

The County shall not supervise, direct, or have control or authority over, nor be responsible for: The Contractor's means, methods, techniques, sequences or procedures of construction; the safety precautions and programs related to safety, or the Contractor's failure to perform or furnish the Work in accordance with the Contract Documents.

3. DISPUTES

a. All disputes or claims arising under this Contract or its interpretation, whether involving law or fact or both, or extra work, and all claims for alleged breach of Contract shall be submitted in writing to the Project Officer or designee as set forth in these General Conditions. Such claims must set forth in detail the amount of the claim, and shall state the facts surrounding it in sufficient detail to identify it together with its character and scope.

b. Claims denied by the Project Officer shall be processed in accordance with the procedures outlined in Sections 7-107, Contractual Disputes and 7-108, Legal Actions of the Arlington County Purchasing Resolution and the Dispute Resolution paragraph in the Agreement.

c. The Contractor shall not cause a delay in the work pending a decision of the Project Officer or designee, County Manager, County Board, or court, except by prior written approval of the Project Officer or designee.

4. INSPECTION OF WORK

The Project Officer or designee and representatives of any public authority having jurisdiction shall, at all times, have access to the Work while in progress. The Contractor shall provide suitable facilities for such access and for proper observation of the Work and shall conduct all special tests required by the Specifications, the Project Officer or designee's instructions, and any laws, ordinances or the regulations of any public

authority applicable to the work. Nothing in this section shall abrogate or otherwise limits or relieves the Contractor's independent duty to inspect the Work.

5. INSPECTION OF MATERIALS

All articles, materials, and supplies purchased by the Contractor for the Work are subject to inspection upon delivery to the site and during manufacturing or fabrication The County reserves the right to return for full credit, at the risk and expense of the Contractor, all or part of the articles, materials, or supplies furnished contrary to Specifications and instructions. Nothing in this section shall abrogate or otherwise limit or relieve the Contractor's independent duty to inspect materials.

6. EXAMINATION OF COMPLETED WORK

If the Project Officer or designee requests it, the Contractor, at any time before acceptance of the Work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the Specifications. Should the work thus exposed or examined prove acceptable, then the uncovering or removing, and the replacing of the covering or making good of the parts removed shall be paid for as extra work, but should the work so exposed or examined prove unacceptable, then the uncovering, removing and replacing shall be at the Contractor's expense.

7. RIGHT TO SUSPEND WORK

The County shall have the authority to suspend the Work, in whole or in part, for such periods and such reasons as the County may deem necessary or desirable. Any such suspension shall be in writing to the Contractor and the Contractor shall obey such order immediately and not resume the Work until so ordered in writing by the County. No such suspension of the Work shall be the basis for a claim by the Contractor for any increase in the Contract Amount provided that the suspension is for a reasonable time under the circumstances then existing. If the suspension of Work is caused by the County's belief that non-conforming work is being installed, and subsequent investigation proves that the Work was non-conforming, the Contractor shall not be awarded additional time or costs.

8. RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a 10-day period after receipt of written notice from the County or such shorter time as may be reasonable under the circumstances, to commence and continue correction of such default or neglect with diligence and promptness, the County may, without prejudice to other remedies the County may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including the County's expenses, and any additional architect or engineering costs necessary by Contractor's default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the County upon demand.

9. CONTRACTOR MANAGEMENT PERSONNEL

The Contractor shall keep a competent superintendent and any necessary assistants on the Site at all times during progress of the Work and such persons shall be satisfactory to the Project Officer or designee. The superintendent or project manager shall not be changed except with the Project Officer or designee's consent. If the Project Officer determines that the superintendent or project manager is no longer satisfactory, then the superintendent or project manager must be replaced within 15 days of the Project Officer's written notice with a replacement superintendent or project manager with equal or superior qualifications and subject to Project Officer approval.

The superintendent and project manager shall represent the Contractor and all directions given to such persons shall be as binding as if given to the Contractor. The Contractor shall at all times enforce strict discipline and good order among the workers performing under this Contract, and shall not employ on the Work any person not reasonably proficient in the Work assigned. Persons permitted to perform Work under Contractor, or any subcontractor, or sub-subcontractor, shall meet all employment eligibility, safety training, security or drug/alcohol testing requirements required by law or by the County. Any person not complying with all such requirements shall be immediately removed from the Site.

The Contractor shall have a qualified and experienced person who can clearly communicate technical matters regarding the subject project. This person shall be available via phone to respond to emergency situations on the project 24 hours a day.

10. DRUG-FREE POLICY

The Contractor is responsible for ensuring that the Site remains a drug-free site. Contractor will require that employees undergo random drug/alcohol screening on a quarterly interval. Any employee who fails the test must be removed from the Site immediately. Random screening shall be performed by a third party licensed to do so in the Commonwealth of Virginia. The Contractor shall provide its random testing policy and schedule to the Project Officer within 30 days of Notice to Proceed. The Contractor will include this provision in every subcontract relating to this Contract. Any infraction by an employee of the Drug-Free policy shall be reported to the Project Officer within 24 hours.

11. LANDS BY COUNTY

The County shall provide access to the lands shown on the Drawings upon which the Work under the Contract is to be performed and to be used for rights of way and for access. In case all the lands, rights-of-way or easements have not been obtained as herein contemplated before construction begins, then the Contractor shall begin its work on such lands and rights-of-way that the County has acquired access to. No additional time or compensation shall be awarded to the Contractor for modifying work location and sequence provided other locations are available for work.

Contractor shall verify the acquisition of all off-site easements and Rights-of-Way prior to the start of off-site construction. Restore all off-site easements to the conditions existing prior to the start of work.

The Contractor shall confine all activities at the site associated with construction activities, to include storage of equipment and or materials, access to the work, formwork, etc. to within the designated Limits of Disturbance (LOD).

12. LANDS BY CONTRACTOR

If the Contractor requires additional land or lands for temporary construction facilities and for storage of materials and equipment other than the areas available on the site or right-of-way, or as otherwise furnished by the County, then the Contractor shall provide such other lands and access thereto entirely at the Contractor's own expense and without liability to the County. The Contractor shall not enter upon private property for any purpose without prior written permission of all of the persons and entities who own the property. The Contractor shall provide copies of all agreements to the County and shall include language in the agreement indemnifying and holding the County harmless for any damages, repairs, restoration or fees associated with the use of the property. Upon termination of the agreement, the Contractor shall provide to the County a fully executed release from the property owner.

13. PROTECTION OF WORK AND PROPERTY

a. The Contractor shall continuously maintain and protect all of its Work from damage and shall protect the County's property from damage or loss arising in connection with this Contract until Substantial Completion. After Substantial Completion, the maintenance or protection of any incomplete or remedial Work identified on the punch list that requires maintenance or protection in order to allow for the final completion and acceptance of such Work shall be the responsibility of the Contractor until Final Completion. The Contractor shall make good any such damage or loss, except such as may be caused by agents or employees of the County. Failure to adequately protect the Work shall not be grounds for additional compensation for any maintenance and/or repairs to such Work.

b. The Contractor shall not place upon the Work, or any part thereof, any loads which are not consistent with the design strength of that portion of the Work.

c. The Contractor shall be responsible for the preservation of all public and private property, trees, monuments, etc., along and adjacent to the street and/or right-of-way, and shall use every precaution to prevent damage to pipes, conduits and other underground structures, curbs, pavements, etc., except those to be removed or abandoned in place and shall protect carefully from disturbance or damage all monuments and property marks until an authorized agent has witnessed or otherwise

referenced their location and shall not remove them until directed. Any damage which occurs by reason of the operations under this Contract, whether shown or not on the approved construction plans, shall be completely repaired or replaced to the County's satisfaction by the Contractor at the Contractor's expense. The Contractor shall be responsible for all damages caused by their construction activities.

d. Prior to commencing construction activity at the Site, the Contractor shall videotape the Site and an additional fifty (50) feet outside the perimeter of the Site. Contractor shall submit a copy of high resolution digital recording on a DVD or flash drive to the County. The recording shall be stable, continuous, and contain all items within the limits of Work. Submission of the DVD to the County shall be a condition precedent to any obligation of the County to consider an Application for Payment. The DVD shall be the property of the County, and the County shall be permitted to reproduce such DVD's and use the same for any purpose without limitation or claim of ownership or compensation from any party. Contractor shall incorporate the cost of the preconstruction survey in the bid amount or the unit prices of the bid items, as applicable. No additional payment will be made by the County.

e. The Contractor shall shore, brace, underpin, secure, and protect, as may be necessary, all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site that may be affected in any way by excavations or other operations connected with the work required under this Contract. The Contractor shall be responsible for giving any and all required notices to owners or occupants of any adjoining or adjacent property or other relevant parties before commencement of any work. Contractor shall provide all engineering (signed and sealed) for items listed in this section per the Specifications. The Contractor shall indemnify and hold the County harmless from any damages on account of settlements or loss of all damages for which the County may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

f. In an emergency affecting the safety of life or of the Work, or of adjoining property, the Contractor, without special instruction or authorization from the Project Officer or designee, or the County, is hereby permitted to act, at the Contractor's discretion, to prevent such threatened loss or injury, and the Contractor shall so act without appeal, if so instructed or authorized.

g. The Contractor shall contact "Miss Utility" at 811 for marking the locations of existing underground utilities (i.e. Water, sewer, gas, telephone, electric, and cable tv) at least 72 hours prior to any excavation or construction. The Contractor is required to identify and protect all other utility lines found in the work site area belonging to other owners that are not members of "Miss Utility". Private water

and/or sewer laterals will not be marked by “Miss Utility” or the County. The Contractor shall locate and protect these services during construction.

14. SEPARATE CONTRACTS

a. The County reserves the right to let other contracts in connection with this Project. The Contractor shall afford other contractors reasonable access to the Project including storage of their materials and the execution of their work, and shall properly connect and coordinate its work with the work of other such contractors.

b. If any part of the Contractor's work depends, for proper execution or results, upon the work of any other contractor, the Contractor shall inspect and promptly report to the Project Officer or designee any defects in such work that renders it unsuitable for such proper execution and results. The Contractor's failure to so inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of the Contractor's work, except as to defects which may develop in other contractor's work after its execution.

c. If the Contractor or any of the Contractor's subcontractors or employees cause loss or damage to any separate contractor on the Work, the Contractor agrees to settle or make every effort to settle or compromise with such separate contractor. If such separate contractor sues the County on account of any loss so sustained, the County shall notify the Contractor, who shall indemnify and save the County harmless against any expense, claim or judgment arising therefrom, including reasonable attorney's fees.

d. In case of a dispute arising between two or more separate contractors engaged on adjacent work as to the respective rights of each under their respective contracts, the Project Officer shall determine the rights of the parties.

15. SUBCONTRACTS

a. Unless otherwise specified, the Contractor shall, within fifteen (15) calendar days after the execution of the Contract by the County, provide to the Project Officer or designee, in writing, the names of all subcontractors proposed for the principal parts of the Work and for such others as requested by the Project Officer or designee, and shall not employ any subcontractors that the Project Officer or designee may object to as incompetent or unfit after an appropriate determination of the subcontractor's ability. No proposed subcontractor will be disapproved except for cause.

b. The Contractor shall make no substitutions for any subcontractor previously selected/approved unless first submitted to the County for approval.

c. The Contractor shall be as fully responsible to the County for the acts and omissions of the Contractor's subcontractors as the Contractor is for the acts and omissions of persons directly employed by the Contractor.

d. The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind subcontractors to the Contractor by the terms of the General Conditions of the Contract, Special Provisions and other Contract Documents comprising the Contract insofar as such documents are applicable to the work of subcontractors.

e. Nothing contained in the Contract shall be construed to create any contractual relation between any subcontractor and the County, nor shall it establish any obligation on the part of the County to pay to, or see to the payment of any sums to any subcontractor. The County will not discuss, negotiate or otherwise engage in any contractual disputes with any subcontractor.

f. If requested by the County, the Contractor shall replace any subcontractor at no cost to the County within 30 days of the Project Officers written notice or as otherwise specified. No additional time or compensation will be provided in the event a subcontractor is removed due to non-compliance of the requirements outlined within the Contract.

16. ELIMINATED ITEMS

If any item(s) in the Contract are determined to be unnecessary for the proper completion of the Work contracted, the Project Officer or designee may, upon written notice to the Contractor, eliminate such item(s) from the Contract. Payment will not be made for such item(s) so eliminated; except that the Contractor will be compensated for the actual cost of any work performed and the net cost of materials purchased before the item(s) was eliminated from the Contract, including freight and tax costs, as evidenced by invoice. No additional compensation will be made for overhead or anticipated profit. The County will receive the full unit price credit for work eliminated prior to production or installation.

17. COUNTY ORDINANCES

The Contractor shall comply with all applicable County ordinances, including but not limited to: the *Noise Control, Erosion & Sediment Control, Storm Water Management, and Chesapeake Bay Preservation ordinances (Chapters 15, 57, 60, and 61 of the County Code).*

## D. MATERIALS AND WORKMANSHIP

### 1. MATERIALS FURNISHED BY THE CONTRACTOR

Unless otherwise specified, all materials and equipment incorporated in the Work under the Contract shall be new. All work shall be accomplished by persons qualified in the respective trades.

### 2. IBC AND VUSBC REQUIREMENTS

The Contractor certifies that all material supplied or used under this Contract meets all current International Building Code (IBC) requirements and the requirements of the Virginia Uniform Statewide Building Code (VUSBC); and further certifies that, if the material delivered or used in the performance of the work is found to be deficient in any of the applicable state or national code requirements, all costs necessary to bring the material into compliance with the requirements shall be borne by the Contractor. The County shall be entitled to offset such costs against any sums owed by the County to the Contractor under this Contract.

### 3. ADA COMPLIANCE

The Contractor shall ensure that all Work performed under this Agreement is completed in accordance with the Contract Documents, including Work intended to meet the accessibility requirements of the Americans with Disabilities Act (ADA).

The Contractor is not required to ascertain whether the Contract Documents meet ADA design standards and guidelines. However, should the Contractor discover any non-conformity with such requirements, the Contractor shall immediately inform the County and its design consultant, if applicable, to allow for corrective action.

The Contractor shall defend and hold the County harmless from any expense or liability arising from the Contractor’s non-compliance in meeting its obligations herein. The Contractor shall be responsible for all costs related to permitting delays, redesign, corrective Work, and litigation relating to such non-compliance.

### 4. MANUFACTURER'S DIRECTIONS

Manufactured articles, material, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's directions as accepted by the Project Officer or designee, unless herein specified to the contrary.

### 5. WARRANTY

All material provided to the County shall be fully guaranteed by the Contractor against manufacturing defects within the period of the manufacturer's standard warranty. Such defects shall be corrected by the Contractor at no expense to the County. The Contractor shall provide all manufacturers’ warranties to the Project Officer by the date of Final Completion.

All Work is guaranteed by the Contractor against defects resulting from the use of inferior or faulty materials. The Contractor warrants that the Work will conform to the

requirements of the Contract Documents and will be free from defects or inferior or faulty workmanship, or work not in accordance with the Contract Documents for one (1) year from the date of Substantial Completion or as set forth in the Specifications of the work by the County in addition to and irrespective of any manufacturer's or supplier's warranty.

No date other than Substantial Completion or as set forth in the Specifications shall govern the effective date of the Warranty, unless that date is agreed upon by the County and the Contractor in advance and in a signed writing.

The Contractor shall promptly correct any defective work or materials after receipt of a written notice from the County to do so. If the Contractor fails to proceed promptly or use its best efforts and due diligence to complete such compliance as quickly as possible, the County may have the materials or work corrected and the Contractor and its Sureties shall be liable for all expenses and costs incurred by the County.

Nothing contained in this section shall be construed to establish a period of limitations with respect to other obligations the Contractor may have under this Contract.

6. INSPECTION AND ACCEPTANCE OF MATERIALS

Inspection and acceptance by the County will be at the work site in Arlington County, Virginia and within ten (10) calendar days of delivery unless otherwise provided for in the Contract Documents. The County will not inspect, accept, or pay for any materials stored or delivered off-site by the Contractor, except as provided by the Payment for Stored Materials clause of these General Conditions and other requirements of the Contract Documents. The County's right of inspection shall not be deemed to relieve the Contractor of its obligation to ensure that all articles, materials and supplies are consistent with Specifications and instructions and are fit for their intended use. The County reserves the right to conduct any tests or inspections it may deem appropriate before acceptance. The Contractor shall be responsible for maintaining all materials and supplies in the condition in which they were accepted until they are used in the work.

The Contractor is to coordinate its work and request inspections in such a manner as to minimize the cost to the County without impacting the overall schedule of the Project within reason. All costs associated with re-inspection shall be borne by the Contractor.

7. CONTRACTOR'S TITLE TO MATERIALS

No materials or supplies for the work shall be purchased by the Contractor or any subcontractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest is retained by the seller. The Contractor warrants that it has good title to, and that it will require all subcontractors to warrant that they have good title to, all materials and supplies for which the Contractor invoices for payment. The County may request proof of title or payment prior to acceptance of the Contractors invoice.

8. TITLE TO MATERIALS AND WORK COVERED BY PARTIAL PAYMENTS

All material and work covered by partial payments made by the County will become the property solely of the County at the time the partial payment is made. However, risk of

loss or damage to all items shall be the responsibility of the Contractor until Final Acceptance by the County. This provision will not be construed as relieving the Contractor from having sole responsibility for all materials and work upon which payments have been made and for the restoration of any damaged work or replacement or repair at the County's option of any damaged materials. This provision will not be construed as a waiver of the County's right to require fulfillment of all terms of the Agreement, including full rights under the terms of the Warranty provisions of the Agreement, nor shall payment indicate acceptance of the materials or work.

9. CONNECTING WORK

The Contractor shall do all cutting, patching, or digging of the Contractor's work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors as shown upon or reasonably implied by the Drawings and Specifications for the completed Project and shall make good after them as the Project Officer or designee may direct. This work will be performed in a workmanlike manner utilizing proper care and equipment to achieve proper line and grade. The Contractor shall not endanger any work by cutting, patching, or digging, or otherwise, and shall not cut or alter the work of any other contract except with the prior written consent of the Project Officer or designee.

10. REJECTED WORK AND MATERIALS

a. Any of the Work or materials, goods, or equipment which do not conform to the requirements of the Contract Documents, or are not equal to samples accepted by the Project Officer or designee, or are in any way unsatisfactory or unsuited to the purpose for which they are intended, shall be rejected and replaced immediately so as not to cause delay to the Project or work by others. Any defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness or any other cause, shall be removed and the work shall be re-executed by the Contractor at the Contractor's expense. The fact that the Project Officer or designee may have previously overlooked such defective work shall not constitute acceptance of any part of it.

b. If the Contractor fails to proceed at once with the replacement of rejected material and/or the correction of defective workmanship when notified to do so by the Project Officer or designee, the County may, by contract or otherwise, replace such material or correct such workmanship and charge the cost to the Contractor. This clause applies during the Contract and during any warranty or guarantee period.

c. The Contractor shall be responsible for managing, addressing within a timely manner, and formally closing out all notices of non-compliance issued by the inspector of record, Arlington County Inspection Services, or the Design Team. The Contractor shall be solely liable for any costs or time associated with the corrective action to address any notices of non-compliance. The Contractor must work directly with the entity issuing the notice of non-compliance.

` d. If the Project Officer or designee deems it expedient not to require correction of work which has been damaged or not done in accordance with the Contract, an appropriate adjustment to the Contract Price may be made.

11. PROHIBITION AGAINST ASBESTOS CONTAINING MATERIALS

No goods or equipment provided to the County or construction material installed shall contain asbestos. If a Contractor or supplier provides or installs any goods, equipment, supplies, or materials that contain asbestos in violation of this prohibition, the Contractor shall be responsible for all costs related to the immediate removal and legal disposal of the goods, equipment or materials containing asbestos and replacement with County-approved alternate. The Contractor shall be responsible for all goods, equipment, supplies or materials installed or provided by any of its employees, agents or subcontractors in connection with the work under this contract. The Contractor shall also reimburse to the County all costs of such goods, equipment, supplies or materials installed if not corrected by the Contractor.

## E. LEGAL RESPONSIBILITY AND PUBLIC SAFETY

1. SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK

The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and locations of the work of the Contract, and that it has investigated and satisfied itself as to the general and local conditions and factors which can affect the Work or its cost, including but not limited to:

a. conditions bearing upon transportation, disposal, handling, and storage of materials;
b. the availability of labor, water, electric power, and roads;
c. uncertainties of weather, river stages, tides, or similar physical conditions at the site;
d. the information and conditions of the ground; and
e. the character of equipment and facilities needed before and during work performance.

The Contractor, by executing the Contract, represents that it has reviewed and understands the Contract Documents and has notified the County of and obtained clarification of any discrepancies which have become apparent during the bidding period. During the Contract, the Contractor must promptly notify the County in writing of any apparent errors, inconsistencies, omissions, ambiguities, construction impracticalities or code violations discovered as a result of the Contractor's review of the Contract Documents including any differences between actual and indicated dimensions, locations and descriptions, and must give the County timely notice in writing of same and of any corrections, clarifications, additional Drawings or Specifications, or other information required to define the Work in greater detail or to permit the proper progress of the Work. The Contractor must provide similar notice with respect to any variance between its review of the Site and physical data and Site conditions observed. If the Contractor performs any Work involving an apparent error, inconsistency, ambiguity, construction impracticality, omission or code violation in the

Contract Documents of which the Contractor is aware, or which could reasonably have been discovered, without prompt written notice to the County and request for correction, clarification or additional information, as appropriate, the Contractor does so at its own risk and expense and all related claims are specifically waived.

The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the County, as well as from the Drawings and Specifications made a part of this Contract. Unless otherwise specified, all existing structures, materials and obstructions that interfere with the new construction shall be removed and disposed of as part of this Contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the Work without additional expense to the County.

The locations of existing utilities, including underground utilities, which may affect the Work, are indicated on the Drawings or in the Specifications insofar as their existence and location were known at the time of preparation of the drawings. However, nothing in these Drawings or Specifications shall be construed as a guarantee that such utilities are in the location indicated or that they actually exist, or that other utilities are not within the area of the operations. The Contractor shall make all necessary investigations to determine the existence and locations of such utilities. Should uncharted or incorrectly charted utilities be encountered during performance of the Work, notify the Project Officer or designee immediately for instructions. The Contractor will be held responsible for any damage to and maintenance and protection of existing utilities and structures, of both public and private ownership. However, if it is determined that such existing utility lines or structures require relocation or reconstruction or any other work beyond normal protection, then such additional work will be ordered under the terms of the clause entitled "Changes in Work." At all times, cooperate with the County and utility companies to keep utility services and facilities in operation.

The County assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the County. The County assumes no responsibility for any understanding reached or representation made concerning conditions which can affect the Work by any of its officers or agents before the execution of this Contract, unless that understanding or representation is expressly stated in this Contract.

2. PUBLIC CONVENIENCE

The Contractor shall at all times so conduct its Work as to ensure the least possible obstruction to traffic (vehicular, bicycle and pedestrian) and inconvenience to the general public, County employees, and the residents in the vicinity of the Work. Traffic shall be maintained in accordance with the approved Maintenance of Traffic (MOT) plan. No road, street or sidewalk shall be closed to the public except with the permission of the Project Officer or designee and or proper governmental authority. Fire hydrants on or adjacent to the Work shall be kept accessible to firefighting equipment at all times. Temporary provisions shall be made by the Contractor and included in the cost of

the Work to ensure the use of sidewalks, trails, and transit facilities compliant with all applicable ADA and other regulations, as well as the proper functioning of all gutters, drainage inlets, drainage ditches, and irrigation ditches, which shall not be obstructed except as approved by the Project Officer or designee.

The Contractor is responsible for securing its work area for safety and security. The Contractor shall confine its construction and presence to the Limits of Work, unless otherwise approved by the County Project Officer.

3. SAFETY AND ACCIDENT PREVENTION

The Contractor shall comply with, and ensure that the Contractor's employees and subcontractors comply with, all current applicable local, state and federal policies, regulations and standards relating to safety and health, including, by way of illustration and not limitation, the U.S. Department of Labor's Occupational Safety and Hazard Administration (OSHA) Construction Industry Regulations, the standards of the Virginia Occupational Safety and Health program of the Department of Labor and Industry for General Industry and for the Construction Industry, the Federal Environmental Protection Agency Standards and the applicable standards of the Virginia Department of Environmental Quality.

The Contractor shall provide, or cause to be provided, all technical expertise, qualified personnel, equipment, tools and material to safely accomplish the Work specified to be performed by the Contractor and subcontractor(s).

The Contractor shall identify to the County Project Officer at least one on-site person who is the Contractor's competent, qualified, and authorized safety officer on the worksite and who is, by training or experience, familiar with and trained in policies, regulations and standards applicable to the work being performed. The competent, qualified and authorized person must be capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, shall be capable of ensuring that applicable safety regulations are complied with, and shall have the authority and responsibility to take prompt corrective measures, which may include removal of the Contractor's personnel from the work site.

The Contractor shall provide to the County, within 7 days of issuance of the Notice to Proceed, a copy of the Contractor's written safety policies and safety procedures applicable to the scope of work. Failure to provide this information within may result in cancellation of the Contract.

The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all injury to persons and damage to property either on or off the site, which occur as a result of the Contractor's prosecution of the Work.

The Contractor shall take or cause to be taken such additional safety and health measures as the County may determine to be reasonably necessary. Machinery, equipment, and all hazards shall be guarded in accordance with the safety provisions of

the current version of "Manual of Accident Prevention" published by the Associated General Contractors of America, Inc., to the extent that such provisions are not in conflict with applicable local laws. The Contractor is directed to the "Rules and Regulations Governing Construction, Demolition and All Excavation" and adopted by the Safety Codes Commission of Virginia, 1966, or latest edition, covering requirements for shoring, bracing, and sheet piling of trench excavations.

4. HAZARDOUS MATERIALS

Arlington County is subject to the Hazard Communication Standard, 29 CFR §1910.1200 (Standard). The Contractor agrees that it will provide or cause to be provided Safety Data Sheets (SDS) required under the Standard for all hazardous materials supplied to the County or used in the performance of the work. Such SDS shall be delivered to the County no later than the time of actual delivery of any hazardous materials to the County or use of such material in the performance of work under the Contract by the Contractor or its subcontractors, whichever occurs first. Container labeling meeting the requirements of the Standard shall be appropriately affixed to the shipping or internal containers. The County reserves the right to refuse shipments of hazardous materials not appropriately labeled, or when SDS have not been received prior to or at the time of receipt of the shipment for use by the County or for use by the Contractor in the performance of the Contract, or whenever the material is delivered in a manner inconsistent with any applicable law or regulation. Any expenses incurred due to the refusal or rejection of SDS are the responsibility of the Contractor. The Contractor shall comply with all federal, state, and local laws governing the storage, transportation, and use of toxic and hazardous materials. The Contractor shall maintain onsite an up to date SDS binder for all material used and delivered to the Project. The County Project Officer or his designee shall be allowed access to the SDS book at all times.

5. HAZARDOUS WASTE

Hazardous Waste Generator/Hazardous Waste Disposal: The County Board of Arlington County, Virginia and the Contractor shall be listed as Co-generators. The Contractor shall assume all the duties pertaining to the Waste Generator, including signing the Waste Shipment Record ("WSR") and manifest. The Contractor shall supply the County Project Officer with the executed original Owner's Copy of the WSR, as required by applicable regulatory agencies within 35 days from the time the waste was accepted by the initial waste transporter, and prior to request for final payment. A separate WSR shall be submitted for each shipment to the disposal site.

Delayed Waste Shipment Records: The Contractor shall report in writing to the EPA Region III office within 45 days if an executed copy of the WSR is not received from the operator of the disposal site. The report to the EPA regional office shall include a copy of the original WSR and a cover letter signed by the Contractor stating the efforts taken to locate the hazardous waste shipment and the results of those efforts.

Temporary Hazardous Waste Storage Prohibited: The Contractor shall not temporarily store hazardous waste unless pre-approved by the County in writing. If so approved, hazardous waste stored off-site in a temporary facility shall be monitored and records shall be kept on the number of containers, size, and weight. The Contractor shall inform the County when the hazardous waste is to be transported to the final disposal site. The

County has the right to inspect the temporary site at any time. The Contractor shall submit copies of all relevant manifests, Waste Shipment Record(s), and landfill receipts to the County Project Officer prior to the request for final payment. All paperwork shall be signed by the Contractor and disposal site operator as required.

6. ASBESTOS

Whenever and wherever during the course of performing any work under this Contract the Contractor discovers the presence of asbestos or suspects that asbestos is present, the Contractor shall stop work immediately, secure the area, notify the County Project Officer immediately and await positive identification of the suspect material. During the downtime in such a case, the Contractor shall not disturb any surrounding surfaces but shall protect the area with suitable dust covers. Work shall not proceed without an Asbestos-Related Work Authorization executed by the County Asbestos Program Manager.

7. CROSSING UTILITIES

When construction crosses highways, railroads, streets, waterways, or utilities under the jurisdiction of State, County, City, or other public agency, public utility, or private entity, the Contractor shall secure written permission where necessary from the proper authority before executing such new construction. A copy of such written permission must be filed with the County before any work is started. The Contractor shall be required to furnish a release from the proper authority before Final Acceptance of the Work.

8. OVERHEAD HIGH VOLTAGE LINES SAFETY ACT

If any work required herein will be performed within ten feet of an overhead high voltage line, the provisions of Virginia Statute 59.1-406, et. seq., "Overhead High Voltage Line Safety Act" (Act) shall apply. The "person or contractor responsible for the work to be done", as that term is used in the Act, will be interpreted to mean the Contractor. The Contractor shall notify the owner or operator of the high voltage line in the manner prescribed in Section 59.1-411 of the Act in sufficient time prior to the time work is to be commenced to avoid any delays in the work. The County will not pay for lost time, profits, or permit any extension of the work for any delays caused by the failure of the Contractor to make such arrangements in a timely manner. All costs for the work shall be paid by the Contractor. The County shall reimburse the Contractor for the actual reasonable cost paid to the owner or operator of the high voltage line by the Contractor on presentation to the County by the Contractor of original invoices from the owner or operator of the high voltage line in the same manner as for other Contractor invoices submitted for work performed. Retention, if applicable to the Contract, shall not be withheld from the payment to the Contractor by the County for this work. No processing, administrative, or other charges above the actual amount charged by the owner or operator of the high voltage line shall be paid to the Contractor by the County.

9. SANITARY PROVISIONS

The Contractor shall provide and maintain such sanitary accommodations for the use of the Contractor's employees and those of its subcontractors as may be necessary to

comply with the requirements and regulations of OSHA and of the local and State departments of health.

10. SITE CLEAN-UP AND WASTE DISPOSAL

The Contractor shall frequently remove and properly dispose of all refuse, rubbish, scrap materials, and debris from the site resulting from the Contractor's operations during the performance of this contract. The Contractor shall ensure the work site presents a neat and orderly appearance at all times. The Contractor shall isolate any and all dumpsters, trash cans and recycling bins provided for the Project from public use until Final Acceptance.

Unless otherwise stated, the Contract Amount and any unit prices shall include all costs and fees for removal and disposal of all waste and debris, whether disposed of at a County site or at any other location.

The Contractor shall remove all surplus material, false work, temporary structures including foundations thereof, and debris resulting from the Contractor's operations at work completion and before Final Acceptance. The County shall reserve the right to remove the surplus material, false work, temporary structures including foundations and debris. The County will restore the site to a neat, orderly condition if the Contractor fails to do so. The County shall be entitled to offset such cost against any sums owed by the County to the Contractor under this Contract.

11. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

When the Project includes an approved SWPPP, the Contractor shall strictly abide by this plan which includes: a Pollution Prevention (P2) Plan, an Erosion and Sediment Control (E&S) Plan, and a Stormwater Management Plan. If the Contractor proposes to deviate from this approved plan, it shall be the Contractor's responsibility to coordinate and obtain approval from the County Project Officer prior to implementing any changes.

No separate payment shall be made by the County for SWPPP implementation, with the exception of E&S items as specified on the E&S plans or listed as pay items. The Contractor shall not be entitled to any additional payment for changes to the SWPPP which are the result of the Contractor's work schedule or resource allocation, weather delays, or other factors not controlled by the County.

## F. PROGRESS AND COMPLETION OF THE WORK

1. NOTICE TO PROCEED

The Contractor shall be given written Notice to Proceed with the Work. Such Notice to Proceed shall state the date on which the Work is to be commenced, and every calendar day thereafter shall be counted in computing the actual Time for Completion.

2. TIME FOR COMPLETION

It is hereby understood and mutually agreed by and between the Contractor and the County that the Commencement Date, the rate of progress, and the Time for

Completion of the Work to be done hereunder are essential conditions of the Contract. The Contractor agrees that the Work shall be started promptly upon receipt of a written Notice to Proceed in accordance with the accepted schedule. The Work shall be prosecuted regularly, diligently, and uninterruptedly at a rate of progress that will ensure full completion of the Project within the Time for Completion specified in the Contract Documents.

3. SCHEDULE OF COMPLETION

Unless otherwise specified, the Contractor shall within 10 business days after the Award Date, or prior to the pre-construction meeting, whichever occurs first, submit schedules which show the order in which the Contractor proposes to carry on the Work, with dates for starting and completing the various activities of the Work. The Contractor shall submit an updated schedule monthly with the request for partial payment. Review and acceptance by the County of the Contractor's schedule of completion shall in no way relieve the Contractor of its responsibility to complete the Work within the contract time. If the Work falls behind the schedule, the County may require the Contractor to prepare and submit, at no extra cost to the County, a recovery schedule indicating by what means the Contractor intends to regain compliance with the schedule. The recovery schedule must be submitted to the County for review by the date indicated in the County's written demand.

4. CONDITIONS FOR COMPLETION

a. SUBSTANTIAL COMPLETION: The Work will be considered Substantially Complete when all of the following conditions have been met and accepted by the Project Officer, and a Certificate of Substantial Completion has been issued:

1. The Contractor has provided formal notice that the Work is substantially complete, and the Project Officer has agreed that the condition of the Work warrants a Substantial Completion inspection;

2. The Contractor has provided a Punch List and that list has been reviewed and approved by the Project Officer. Failure to include an item on the Punch List does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents;

3. Final test reports as required by the Contract and certificates of inspection and approval required for use and occupancy;

4. Fire Marshal's report, if applicable;

5. Approval forms and transfer documents for all utilities;

6. All life safety systems, including fire alarms, visual and audios alarms, fire detectors and fire alarm annunciator system, sprinkler systems, and all mechanical and electrical systems are complete and working in an automatic mode, and the County has been adequately trained in the operation of the systems;

7. The HVAC system Testing and Balancing Report and build air quality test results as required for LEED certification have been accepted by the Project Officer;

8. Operation and Maintenance Manuals have been submitted for review;

9. All documents and verification of training required in accordance with any Commissioning Plan;

10. Mark-ups of construction drawings showing the As-Built or "Record" condition have been submitted for review and approval by the Project Officer;

12. Entrances and egress pathways have been constructed and can remain clear of construction activities;

13. A Certificate of Occupancy has been issued for the space by the County's Inspection Services Division;

14. All Commissioning has performed and completed to the satisfaction of the Project Officer; and

15. Schedule to complete the Punch List and value of Work not yet complete.

b. Upon the Contractor providing notice that the Work is substantially complete, the Project Officer or designee will invite all relevant parties to perform an inspection of the Work, and any noted deficiencies or incomplete items not indicated on the Contractor's punch list will be added. All punch list items, whether generated by the Contractor or any other party on behalf of the County, shall be completed within thirty (30) days of the date of Substantial Completion, unless otherwise agreed to by the County due to seasonal or other extenuating circumstances.

c. FINAL COMPLETION: The Work will be considered Finally Complete when all of the following conditions have been met and accepted and a Final Completion Notice has been issued by the Project Officer:

1. The Contractor has provided formal notice that the Work is complete, and the Project Officer has agreed that the condition of the Work warrants a Final Completion inspection;

2. All construction deficiencies and punch list items have been closed and all construction deficiencies corrected and accepted by the Project Officer;

3. All spare parts and attic stock have been delivered, stored in an orderly manner in a space designated by the Project Officer and a complete inventory list has been verified and accepted by the Project Officer;

4. All warranties and manufacturer certificates and contact information for parties providing warranties have been delivered and accepted by the Project Officer;

5. All final Operating and Maintenance manuals have been delivered and approved and accepted by the Project Officer;

6. All final As-Built Drawings in .pdf format on a CD delivered and accepted by the Project Officer;

7. All commissioning has been completed and any open construction items in the commissioning agent's report have be closed and accepted by the Project Officer; and

8. All LEED documents and submittals, if applicable, to be provided by the Contractor or sub-contractors have been submitted and accepted by the Project Officer.

5. USE OF COMPLETED PORTIONS

The County shall have the right to take possession of and use any completed or partially completed portions of the Work, notwithstanding that the time for completing the entire Work or such portions may not have expired; but taking such possession and use shall not be deemed an acceptance of any work not done in accordance with the Contract Documents. If the Contractor claims that such prior use increases the cost or delays, the completion of remaining work, or causes refinishing of completed work, the Contractor may submit a claim for compensation or extension of time, or both.

## G. MEASUREMENT AND PAYMENT

1. PAYMENTS TO CONTRACTOR

The County will make partial payments, less retainage, to the Contractor monthly on the basis of the Contractor's written estimate of the work performed during the preceding calendar month as approved by the Project Officer or designee.

The Contractor's application for payment shall indicate the amount of work completed to date in a format consistent with the accepted bid and as indicated below:

a. Lump Sum: For lump sum contracts, the Contractor shall provide to the Project Officer a Schedule of Values, and the application for payment will reflect the Schedule of Values and the amount of work completed in those units.

For contracts that include multiple lump sum line items, the application for payment shall reflect the percentage of work completed for each lump sum item. If requested by the Project Officer, the Contractor shall provide a Schedule of Values for each lump sum line item in the contract.

b. Unit Price: The schedule of unit prices in the accepted bid shall be used as the basis for preparing the estimates, and each partial payment shall represent the total value of all units of work completed, computed at the unit prices stated in the Contract, less the aggregate of previous payments.

At the discretion of the Project Officer, payments may alternatively be based on actual quantities and site measurements taken in the field by County staff using the Contract Unit Prices.

If Stipulated Price Items are included in the contract, Work on such Stipulated Price Items shall be carried out only upon written order by the Project Officer. The payment for a Stipulated Price Item shall be made by the County to the Contractor at the related unit price specified in the 'Stipulated Price Items' section of the Bid Form on the same basis as the payment for any other regular Bid Item.

In addition to the amount of work completed to date, the application for payment shall indicate the aggregate of all previous payments for each line item, the retainage previously withheld, and the total payment requested this period.

The Contractor's application for payment will not be reviewed or processed unless an updated schedule is attached. The pay application shall also contain a certification by the Contractor that due and payable amounts have been paid by the Contractor, including payments to subcontractors, for work which previous payment was received by the Contractor from the County.

5. PAYMENT FOR STORED MATERIALS

When requested in writing by the Contractor, payment allowances may be made for material secured for use on the Project and secured at the project site. Such payments will only be made for materials scheduled for incorporation into the work within sixty (60) days.

Payment for materials stored offsite may be considered at the discretion of the Project Officer. Any such request shall be made in writing, and the Contractor shall provide photographs of materials stored offsite, bills of sale, and proof of insurance on the premises at which off-site materials are stored with the application for payment. Payment for stored materials may also be subject to additional requirements contained elsewhere in the Contract Documents.

3. PAYMENTS WITHHELD

The Project Officer or designee may withhold or, on account of subsequently discovered evidence, nullify the whole or a part of any certificate for payment to the extent necessary to protect the County from loss on account of defective work not remedied or withhold payment for violation of any contract term or condition not remedied after sufficient notice given to the Contractor.

Any such withholding shall not result in any liability to the Contractor for damages.

4. COUNTY ORDERED CHANGES IN WORK

The County, without invalidating the Contract, may order extra Work or make changes by addition, deletion or revision in the Work, with the total Contract Amount being adjusted accordingly if applicable. All such work shall be executed under the conditions of the original Contract, except that modification of the Time for Completion caused thereby shall be made at the time of approving such change.

a. Changes in the Work which do not involve extra cost and are not inconsistent with the purpose of the Project can be directed by means of a Field Order. Otherwise, except in an emergency endangering life or property, no extra Work or change shall be made unless in pursuance of a written Construction Change Directive or Change Order and no claim for an addition to the Contract Amount or Contract Time shall be valid unless so ordered.

b. The Contractor shall review any County requested or directed change and shall respond in writing within 14 days after receipt of the proposed change stating the effect of the proposed change upon Contractor's work, including any increase or decrease in Contract time and price. The Contractor shall furnish the County an itemized breakdown of the quantities and prices used in computing the proposed change. The Contractor shall also furnish any sketches, drawings, and or pictures to properly explain the change or impact to the Project Officer. It is the sole responsibility of the Contractor to provide adequate change order backup to satisfy the Project Officer.

c. The value of any such extra work or change shall be proposed by the Contractor in one or more of the following ways: (a) by estimate in a lump sum; (b) by cost and fixed fee; (c) by unit price additions or deletions of quantities stated in the unit price contract; or (d) by any other method permitted under the Arlington County Purchasing Resolution. The Project Officer will determine the method appropriate based on the nature of the changes.

d. If none of the aforementioned methods is agreed upon the Contractor shall proceed with the work without delay under force account, provided the Contractor receives a Construction Change Directive. In such case, the Contractor shall keep and present in such form as the Project Officer or designee may direct, a correct account of the cost, together with vouchers. The Project Officer or designee shall be permitted to verify such records on a daily basis and may require such additional records as are necessary to determine the cost of the change to the Work. The Project Officer or designee shall certify to the amount due to the Contractor, including a reasonable lump sum allowance for overhead and profit. A complete accounting of the extra cost shall be made within 14 days after completion of the work involved in the claim. Refer to Paragraph G.5, *Force Account Work*, below for a description of allowable costs when work is performed under force account.

e. A cost proposal for a change in the Work shall provide a complete breakdown itemizing the estimated quantities and costs of labor, materials, and equipment (base cost) required in addition to any markup used. The allowable percentage markups for overhead and profit for a non-force account change to the Work performed by the Contractor's own forces or performed by the Subcontractor shall be negotiated based on the nature, size, and complexity of the Work involved but shall not exceed the percentages for each category listed below.

1) Subcontractor's markup for overhead and profit for the work it performs in a change to the Work shall be a maximum of fifteen (15%).

2) Contractor's markup for overhead and profit on the Subcontractor's base cost in a change to the Work shall be a maximum of ten percent (10%).

3) Contractor's markup for overhead and profit (including bonds and insurance) for work it performs in a change to the Work shall be a maximum of fifteen percent 15%.

4) The markup for overhead and profit of a sub-subcontractor at any tier on a change to the Work it performs shall be a maximum of fifteen percent (15%). The Contractor and all intervening tiers of subcontractors' markup on such sub-subcontractor's base cost in the change to the Work shall not exceed a total of ten percent (10%).

f. Base Cost is defined as the total of labor, material, and equipment costs, it does not include markup for overhead and profit. The labor costs include only the

costs of employees directly constructing or installing the change in the Work and exclude the costs of employees coordinating or managing the work.

g. The allowable percentage markups for overhead and profit stated above shall compensate the Contractor, subcontractor, and sub-subcontractor for all other costs associated with or relating to the change to the Work including by way of illustration and not limitation, general conditions, supervision, field engineering, coordination, insurance, bond(s), use of small tools, incidental job costs, and all other general and administrative home and field office expenses.

h. Allowable costs for changes in the Work shall not include home office expenses including payroll costs for the Contractor's officers, executives, administrators, project managers, estimators, clerks timekeepers, and other administrative personnel employed by the Contractor, whether at the Site or in the Contractor's principal or branch office for general administration of the Work. These costs are deemed overhead included in the percentage markups in Subsection (e) above.

i. If the change to the Work also changes the Time for Completion by adding days to perform the Work, an itemized accounting of the following Site direct overhead expenses for the change to the time may be considered as allowable costs for compensation in addition to the base cost indicated above:

1) site superintendent's pro-rata salary
2) temporary site office trailer expense
3) temporary site utilities including basic telephone service, electricity, heat, water, and sanitary/toilet facilities.

All other direct and indirect overhead expenses are considered covered by and included in Subsection (e) markups above. In no case shall subcontractor extended overhead be submitted or considered. The County does not have a direct contractual relationship with any subcontractor or supplier and therefore will not direct, discuss or negotiate with subcontractors employed by the Contractor.

j. If Contractor requests an extension to the Time for Completion due to changes in the Work it must provide to the Project Officer adequate documentation substantiating its entitlement for the time extension. The documentation must demonstrate an anticipated actual increase in the time required to complete the Work beyond that allowed by the Contract as adjusted by prior changes to the Work, not just an increase or decrease in the time needed to complete a portion of the total Work. In the event a Critical Path Method (CPM) schedule is required by the Contract, no extension to the Time for Completion shall be granted unless the additional or change to the Work increases the length of the critical path beyond the Time for Completion as demonstrated on the approved CPM schedule or bar chart schedule. Any Float belongs to Arlington County. A written statement in addition to a CPM analysis shall be prepared explaining how no other sequence of work activities could have been performed to

decrease the impact or eliminate the impact altogether. If requested by the Project Officer the Contractor must provide alternate documentation detailing the claim to the County's satisfaction.

k. Any change that will increase the Contract Amount more than 10% will require notice to sureties and require that Performance and Payment Bonds be increased by the Contractor. The increased Performance and Payment Bonds must be sent to the County's Office of the Purchasing Agent within 15 calendar days of the County's approval of such change.

5. FORCE ACCOUNT WORK

A Force Account may be used at the County's discretion and only when either 1) agreement on the valuation of a change cannot be made using the methods described in the preceding paragraph, *County Ordered Changes in the Work*, or 2) the County cannot firmly establish an applicable and acceptable estimate for the cost of the work because the level of effort necessary to perform and complete the work cannot be reasonably estimated or anticipated but can only be determined by performing the work. Because of the significant burden on the County to monitor and control the work, Force Account work is not a preferred method, and it shall be the responsibility of the Contractor to provide all necessary documentation and justification of costs. The rates for labor, equipment and materials to be used in cases of work performed on a force account basis will be compensated as documented below. No costs other than those explicitly listed below shall be allowed:

a. Labor: Before any Force Account work begins, the Contractor shall submit for approval to the Project Officer the proposed hourly rates and associated labor costs (benefits and payroll burden) for all laborers and forepersons to be engaged in the work. The number of laborers and forepersons engaged in the work will be subject to regulation by the Project Officer and shall not exceed the number that the Project officer deems most practical and economical for the work. For all labor and forepersons in direct charge of the force account work, excluding general superintendence, compensation will be as follows:

1) Certified Pay Rate: The Contractor will receive the actual rate of wage or scale as set forth in his most recent payroll for each classification of laborers, and forepersons who are in direct charge of the specific operation. The time allowed for payment will be the number of hours such workers are actually engaged in the work. If overtime work is authorized by the County, payment will be at the normal overtime rate set forth in the Contractor's most recent payroll.

2) Benefits: The Contractor will be entitled to receive the actual cost for any fringe benefits that are regularly provided to the classes of laborers and forepersons engaged in the work and that are not included in the certified pay rate.

3) Payroll Burden: The Contractor will be entitled to receive the actual cost for all costs associated with required payroll taxes and payroll benefits not covered in 2) above, including:
   - Social Security Tax
   - Medicare Tax
   - Unemployment Tax
   - Worker's Compensation Insurance
   - Contractor's Public Liability Insurance
   - Contractor's Property Damage Liability Insurance

4) If the Contractor is unable to provide the necessary documentation for Benefits and Payroll Burden as identified above, the Contractor will be entitled to an additive of 20% of the Certified Hourly Pay Rate as full and final compensation for Benefits and Payroll Burdens

5) Overhead and Profit: The Contractor will be entitled to an additive of 10% on all properly documented and approved costs established in paragraphs 1), 2), 3), and 4) above for all administrative, overhead, and profit associated with labor costs.

6) Subsistence and lodging allowances may be allowed by the Project Officer at the actual and documented costs for lodging and meals if the following conditions are met and the applicable rates and authorization for such costs are established prior to beginning the work. No additives for overhead, administrative, profit, or any other costs will be permitted for subsistence and lodging.

   i. The specific Force Account work is outside the scope of the original contract, requires mobilization of a separate crew not intended to be used on the original contract, and the Contractor's base location is more than 50 miles from the work site, or

   ii. Forces which have been working on the Contract will be used for the Force Account work and have been routinely staying overnight during the life of the Project, and the Force Account Work will warrant an extension of the contract time, and the distance from the Contractor's base location to the work site is more than 50 miles

b. Materials: The Contractor will receive the actual cost of materials accepted by the Project Officer that are delivered and used for the work including taxes, transportation, and handling charges paid by the Contractor, not including labor and equipment rentals as herein set forth, to which 15 percent (15%) of the cost will be added for administration and profit. The Contractor shall make every reasonable effort to take advantage of trade discounts offered by material suppliers. Any discount received shall pass through to the County. Salvageable temporary construction materials will be retained by the County, or their appropriate salvage value shall be credited to the County, at the County's

discretion.

c. Equipment: For all equipment other than small tools, the Contractor will be entitled to rental rates as established herein, and agreed to in writing before the work is begun. Transportation costs directly attributable to Force Account work will be as stated below. Small tools will be considered any equipment which has a new cost of $1000 or less, and will not be eligible for any compensation. The Contractor shall provide the Project Officer a list of all equipment to be used in the work. For each piece of equipment, the list shall include the serial number; date of manufacture; location from which equipment will be transported; and, for rental equipment, the rental rate and name of the company from which it is rented. The number and types of equipment engaged in the work will be subject to regulation by the Project Officer as deemed to be the most practical and economical for the work. No compensation will be allowed for equipment which is inoperable due to mechanical failure. Compensation for equipment shall be as follows:

1) Hourly Base Equipment Rental Rates (Owned Equipment) – For equipment authorized for use in the Force Account work that is owned by the Contractor, the Contractor shall be entitled to an Hourly Base Rental Rate as detailed in the following paragraphs. The Hourly Base Rental Rate for Contractor owned equipment will not exceed 1/176 of the monthly rates of the schedule shown in the *Rental Rate Blue Book* modified in accordance with the *Rental Rate Blue Book* rate adjustment tables that are current at the time the force account is authorized. The rates for equipment not listed in the *Rental Rate Blue Book* schedule shall not exceed the hourly rate being paid for such equipment by the Contractor at the time of the force account authorization. In the absence of such rates, prevailing rates being paid in the area where the authorized work is to be performed shall be used.

2) Hourly Base Equipment Rental Rates (Rented Equipment) – If the Contractor does not possess or have readily available equipment necessary for performing the force account work and such equipment is rented from a source other than a company that is an affiliate of the Contractor, payment will be based on actual invoice rates when the rates are reasonably in line with established rental rates for the equipment in question and are approved by the Project Officer.

3) Hourly Operating Rates – Hourly Operating Rates shall be as established in the Blue Book estimated operating cost per hour. This operating cost will be full compensation for fuel, lubricants, repairs, servicing (greasing, fueling, and oiling), small tools, and any and all incidentals. If rental rates for the equipment being used in the work are not listed in the Blue Book or otherwise readily available, the Hourly Operating Cost will be 15% of the established Hourly Base Rental Rate. If invoices for Rental Equipment include the furnishing of fuel, lubricants, repair, and

servicing, then the Contractor will not be entitled to any Hourly Operating costs for that equipment.

4) Equipment Usage - Equipment usage will be measured by time in hours of actual time engaged in the performance of the work. The Contractor shall be entitled to the applicable Hourly Base Equipment Rental Rate and Hourly Operating Rate for all approved Equipment Usage.

5) Equipment Standby – Standby time is defined as the period of time equipment authorized for Force Account work by the Project Officer is available on-site for the work but is idle for reasons not the fault of the Contractor or normally associated with the efficient and necessary use of that equipment in the overall operation of the work at hand. Hourly rates for Contractor owned equipment on standby, will be at 50 percent (50%) of the rate paid for equipment performing work. Operating costs will not be allowed for equipment on Standby. When equipment is performing work less than 40 hours for any given week and is on standby, payment for standby time will be allowed for up to 40 hours, minus hours performing work. Payment for Standby will be allowed only for working days. Payment for Standby will not be made for the time that equipment is on the Project in excess of 24 hours prior to its actual performance in the force account work.

6) Transporting Costs – When it is necessary to obtain equipment exclusively for Force Account work from sources beyond the Project limits and the Project Officer authorizes the transporting of such equipment to the Project site, the cost of transporting the equipment will be allowed as an expense. Where the transport requires the use for a hauling unit, the allowable expense will consist only of the actual cost incurred for the use of the hauling equipment, or the applicable Blue Book cost, whichever is less. When equipment is transferred under its own power, the allowable Transporting cost shall be 50% of the Hourly Base Equipment Rental Rate.

7) Overhead and Profit – The Contractor shall be entitled to an additive of 10% on all appropriate and approved Equipment Rental, Operating, and Transporting costs as defined above.

d. Subcontracting: The Contractor shall receive the cost of work performed by a subcontractor as determined in (a), (b), and (c) above. In addition, the Contractor will be allowed an allowance per the schedule below for administrative costs and profit.

| Total Cost of Subcontract Work: | Rate Schedule |
|---|---|
| $0 - $10,000 | 10% |
| > $10,000 | $1,000 + 5 % above $10,000 |

e. Other Costs: The Contractor shall not be entitled to any costs associated with Force Account Work other than those specifically identified in this section.

f. Statements: Payments will not be made for work performed on a force account basis until the Contractor has furnished the Project Officer duplicate itemized statements of all costs of such work detailed as follows:

1. Payroll indicating name, classification, date, daily hours, total hours, rate, and extension of each laborer, foreperson
2. Designation, dates, daily hours, total hours, rental rate, and extension for each unit of equipment
3. Quantities of materials, prices, and extensions
4. Transportation of materials
5. Statements shall be accompanied and supported by invoices for all materials used and transportation charges. However, if materials used on the Force Account work are not specifically purchased for such work but are taken from the Contractor's stock, then in lieu of the invoices, the Contractor shall furnish an affidavit certifying that such materials were taken from his stock; that the quantity claimed was actually used; and that the price, transportation, and handling claimed represented his actual cost.

6. CLAIMS FOR EXTRA COST

If the Contractor claims that any event will give rise to a claim for an increase in the Contract Amount or that any instructions from the Project Officer, by drawings or otherwise, will incur him extra cost under the Contract, then, except in emergencies endangering life or property, it shall give the Project Officer written notice thereof no later than three (3) days of the event or instruction. The Contractor thereafter must provide to the Project Officer a full cost proposal within 14 days detailing the amount of additional compensation claimed, together with the basis therefore and documentation supporting the claimed amount. No such claims shall be valid unless so made. If the Project Officer agrees that such event or instructions involve extra cost to the Contractor, any additional compensation will be determined by one of the methods provided in the Changes in Work paragraph of these General Conditions as selected by the Project Officer. All pricing and supporting documentation requirements of the Changes in the Work clause shall apply to claims for extra cost deemed valid under this paragraph.

7. DAMAGES FOR DELAY; EXTENSION OF TIME OTHER THAN FOR WEATHER

a. Excusable Non-Compensable Delays: If and to the extent that the Contractor is delayed at any time in the progress of the Work by a Force Majeure event or other causes outside of the County's control or the Contractor's control and which the Contractor could not have reasonably foreseen, the Contractor may request an extension of the Time for Completion. To be considered for an extension of the Time for Completion, the Contractor shall give the Project Officer timely written notice at the inception of the delay. The Contractor thereafter must provide to the Project Officer a full claim within 14 calendar days of the cessation of the delay and demonstrate that the delay affected the critical path of the accepted schedule and any Float has been consumed. If the Project Officer

agrees with the existence and impact of the delays, the Project Officer shall extend the Time for Completion for the length of time that the Time for Completion was actually delayed thereby. The Contractor shall not be due compensation or damages of any kind as a result of such delay. Delays caused by weather are addressed in Section G.8.

b. Excusable Compensable Delays: If and to the extent that the Contractor is unreasonably delayed at any time in the progress of the Work by any act or omission of the County, its agents or employees, due to causes within the County's control, the Contractor may request an extension of the Time for Completion and/or additional compensation. The Contractor shall give notice to the Project Officer immediately at the time of the occurrence giving rise to the delay and shall give written notice no later than five (5) calendar days after the inception of the delay. The Contractor's written notice shall specify the nature of the delay claimed, the cause of the delay, and the impact of the delay on the Contractor's schedule. Thereafter the Contactor shall provide to the Project Officer a full claim within 14 calendar days of the cessation of the delay. The claim must detail the amount of additional contract time or compensation claimed, together with the basis therefor along with itemized documentation supporting the claim. The itemized documentation must demonstrate that the claimed delay directly affected the critical path of the accepted schedule and any Float has been consumed and the time and/or costs incurred by the Contractor are directly attributable to the delay in the work claimed. The Contractor shall be entitled to additional compensation only if the delay was caused solely by acts or omission of the County, its agents or employees, or due to causes within their control.

If the Contractor is entitled to compensation, an itemized accounting of the following direct site overhead expenses will be considered as allowable costs to be used in determining the compensation due the Contractor: the site superintendent(s) (as identified at the inception of the work) pro rata salary, temporary site facilities, temporary site office expense, and temporary site utilities including basic telephone service, electricity, heat, water, and sanitary/toilets. A fifteen percent (15%) markup of these expenses will be allowed to compensate the Contractor for home office and other direct or indirect overhead.

Furthermore, compensation for the delay shall be calculated from the contractual Time for Completion, as adjusted by Change Order, and shall not be calculated based on any early completion planned or scheduled by the Contractor

c. Non-Excusable Non-Compensable Delays: The Contractor shall not be entitled to an extension of the Time for Completion or to any additional compensation for delays if and to the extent they are caused by acts, omissions, fault, or negligence of the Contractor or its subcontractors, agents, or employees or due to foreseeable causes within their control, including, but not limited to, delays resulting from defective work, including workmanship and/or materials, from rejected work which must be corrected before dependent work can proceed, from defective work or rejected work for which corrective action must be determined before like work can proceed, from incomplete,

incorrect, or unacceptable Submittals or samples, or from the failure to furnish enough properly skilled workers, proper materials or necessary equipment to diligently perform the work in a timely manner in accordance with the Project schedule.

d. No extension of time or additional compensation shall be given for a delay if the Contractor failed to give notice in the manner and within the time prescribed herein. Furthermore, no extension of time or additional compensation shall be given for any delay unless a full claim is made to the Project Offer within 14 days of the end of the delay. Failure to give written notice or failure to present a timely claim shall constitute a waiver of any claim for extension or additional compensation based upon that cause.

e. If the Contractor submits a claim for damages pursuant to this Section, the Contractor shall be liable to the County for a percentage of all costs incurred by the County in investigating, analyzing, negotiating and litigating the claim, which percentage shall be equal to the percentage of the Contractor's total delay claim that is determined through litigation to be false or to have no basis in law or fact (Virginia Code §2.2-4335).

f. Any change in the Time for Completion or additional compensation shall be accomplished only by the issuance of a Change Order.

8. TIME EXTENSIONS FOR WEATHER

The Contractor's sole relief on any claims for delay which is caused by abnormal weather shall be an extension of the Time for Completion provided the Contractor gave the Project Officer written notice no later than five (5) calendar days after the onset of such delay and provided the weather affected the Critical Path. A fully-documented claim for a time extension under this Section must be submitted no later than thirty (30) calendar days after the cessation of the delay. It shall be the Contractor's responsibility to provide the necessary documentation to satisfy the Project Officer that the weather conditions claimed were encountered, which may include daily reports by the Contractor, copies of notification of weather days to the Project Officer, NOAA backup, and pictures from each day claimed.

The Time for Completion will not be extended due to inclement weather conditions which are normal, as defined below, for Arlington County. The Time for Completion includes an allowance for workdays (based on five (5) day workweek) which according to historical data may not be suitable for construction work. The Contractor may request extension to the Time for Completion if it can demonstrate unusual and disruptive weather conditions per the requirements below:

a. That one or more of the Weather Conditions listed below was encountered; and,
b. The occurrence of the Weather Condition(s) resulted in an inability to prosecute work which would have otherwise been performed on the day(s) the Weather Condition(s) occurred; and,
c. The work which was not able to be completed was on the Critical Path and could not be completed ***only*** due to the Weather Condition(s) claimed.

The Project Officer will determine the Contractor's entitlement to an extension of the Time for Completion. A time extension of no more than one (1) day will be granted for one (1) day of lost work which satisfies the requirements above, regardless of the number of Weather Conditions encountered. The Contractor's sole relief shall be an extension of the Time for Completion and no claim for an increase in Contract Amount will be allowed.

The Weather Conditions listed below will be the only basis for consideration by the County, based upon the requirements listed above, as an extension of the Time for Completion due to inclement weather or weather-related site conditions.

**Weather Condition #1: Unusually Heavy Precipitation** - Figure 1 illustrates the anticipated monthly inclement weather due to precipitation (Rain Days). If the number of days with precipitation in excess of 0.10", as recorded at Washington Reagan National Airport, exceeds the anticipated Rain Days, the Contractor will be entitled to an extension of one (1) day on the Time for Completion for every day in excess of the Rain Days illustrated in Figure 1. The anticipated value of Rain Days for partial months at the beginning and end of the Contract shall be evaluated on a pro-rated basis.

**FIGURE 1**

Average days with precipitation of 0.1" or more

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 6 | 7 | 6 | 8 | 6 | 7 | 6 | 6 | 5 | 6 | 6 |

Weather days are not exclusive to the individual months that they represent in Figure 1. If weather days are not used in a previous month(s) they can be used to offset weather delays in subsequent months. This will be reviewed on a case by case basis and is subject to reconciliation at the end of the Project.

**Condition #2: Temperature** – The Contractor may be entitled to an additional day for every day that the recorded high temperature at Washington Reagan National Airport is 32 degrees Fahrenheit or less, that has not already been incurred under Weather Condition #1 above. This condition does not apply to vertical construction as defined by the Arlington County Vertical Construction Standards.

9. RELEASE OF LIENS

The County, before making final payment, shall require the Contractor to furnish a complete release of all liens arising out of this Contract. The Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the County, to indemnify him against any lien. If any lien remains unsatisfied after all payments have been made, the Contractor shall refund to the County all money that the latter may be compelled to pay in discharging such lien. However, the County may make payments in part or in full to the Contractor without requiring the releases or receipts, and the payments so made shall not impair the obligations of any Surety or Sureties on any bond or bonds furnished under this Contract.

10. FINAL PAYMENT

After the Contractor has completed all work and corrections to the satisfaction of the Project Officer or designee and delivered all maintenance and operating instructions, schedules, quantities, bonds, certificates of inspection, maintenance records, As-Built Drawings, and other items required as final payment submittal documents, the Contractor may make application for final payment following the procedure for progress payments. The Final Application for Payment shall be accompanied by all documents required in the Contract, including a complete and signed and notarized copy of the Final Payment Release Form as follows:

**RELEASE AND REQUEST FOR FINAL PAYMENT**

CONTRACT NUMBER:_____ CONTRACTOR NAME:_____

FINAL PAYMENT AMOUNT:_____

The Contractor hereby requests final payment in the amount indicated on the above referenced Contract. The Contractor agrees that its acceptance of final payment releases and forever discharges Arlington County and its officers, employees, servants and agents from any and all actions, claims, demands and liability of whatever nature now existing or which may hereafter arise as a result of or in connection with the above referenced Contract.

The Contractor certifies that all of the debts for labor, materials, and equipment incurred in connection with the above referenced Contract have been fully paid.

AUTHORIZED SIGNATURE DATE: _____

The date of Final Acceptance is the date on which the County issues the final payment for the work performed.

COMMONWEALTH OF VIRGINIA

COUNTY OF ARLINGTON

On this the _____ day of _____, 20___, before me, personally appeared _____, who acknowledged himself/herself to be _____ in the above instrument, and that he/she, as such _____, being authorized so to do, executed the foregoing instrument for the purposes therein contained, by signing his/her name by himself/herself as _____.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

_____
Notary Public

My Commission Expires:_____

## IV. INSURANCE REQUIREMENTS

Review this section carefully with your insurance agent or broker prior to submitting a bid or proposal. See the Insurance Checklist (part of the Bid or Proposal Forms) for specific coverages applicable to this Contract. The term "Contract," as used in this section, shall mean the fully executed Agreement covering the work entered into between the County and the Contractor.

1. General

1.1 The Contractor shall provide insurance as specified in the Insurance Checklist found on the last page of the bid or proposal form.

1.2 The Contract with the Contractor will not be executed by the County until the Contractor has obtained, at its own expense, all of the insurance called for hereunder and such insurance has been approved by the County; additionally, the Contractor shall not allow any subcontractor to start work on any subcontract until all insurance required of the subcontractor has been so obtained and approved by the Contractor. The Contractor shall submit to the County Purchasing Agent copies of all required endorsements and documentation of coverage consistent with the requirements herein or, alternately, at the County's request, certified copies of the required insurance policies in compliance with the insurance requirements. All endorsements and documentation shall state this Contract's number and title.

1.3 The Contractor shall require all subcontractors to maintain during the term of this Agreement, Commercial General Liability insurance, Business Automobile Liability insurance, and Workers' Compensation, Employers' Liability insurance, or any other insurance required by the Contract in the same manner and form as specified for the Contractor. The Contractor shall furnish subcontractors' evidence of insurance and copies of endorsements to the County Purchasing Agent immediately upon request by the County and/or prior to the subcontractor's performance of work related to this Contract.

1.4 If there is a material change or reduction in coverage, nonrenewal of any insurance coverage or cancellation of any insurance coverage required by this contract, the Contractor shall notify the Purchasing Agent immediately. It is the Contractor's responsibility to notify the County upon receipt of a notice indicating that the policy will not be renewed or will be materially changed. Any policy on which the Contractor has received notification from an insurer that the policy has or will be cancelled or materially changed or reduced must be immediately replaced with another policy consistent with the terms of this Contract and in such a manner that there is no lapse in coverage, and the County immediately notified of the replacement. Not having the required insurance throughout the Contract is considered a material breach of this Contract and grounds for termination. The Contractor shall also obtain an endorsement providing to the County thirty (30) days advance notice of cancellation or nonrenewal (ten days for nonpayment of premium. A copy of that endorsement shall be provided to the County Purchasing Agent prior to the execution of this Contract or any Contract extension thereafter.

1.5 No acceptance and/or approval of any insurance by the County shall be construed as relieving or excusing the Contractor, any surety, or any bond, from any liability or obligation imposed under this Agreement.

1.6 Arlington County, and its officers, elected and appointed officials, employees, and agents are to be listed as additional insureds under all coverages except Workers' Compensation, Professional

Liability, and Automobile Liability, and the endorsement must clearly identify the County as an additional insured permitted to enjoy all the benefits under the applicable policy of insurance. The certified policy, if requested, must so state coverage afforded under this paragraph shall be primary as respects the County, its officers, elected and appointed officials, agents and employees. The following definition of the term "County" applies to all policies issued under the Contract and to all applicable endorsements:

> "The County Board of Arlington County and any affiliated or subsidiary Board, Authority, Committee, or Independent Agency (including those newly constituted), provided that such affiliated or subsidiary Board, Authority, Committee, or Independent Agency is either a Body Politic created by the County Board of Arlington County, Virginia, or one in which controlling interest is vested in Arlington County; and Arlington County Constitutional Officers."

1.7 The Contractor shall be responsible for the work performed under the Contract Documents and every part thereof, and for all materials, tools, equipment, appliances, and property of any description used in connection with the work. The Contractor assumes all risks for direct and indirect damage or injury to the property or persons used or employed on or in connection with the Work contracted for, and of all damage or injury to any person or property wherever located, resulting from any action, omission, commission or operation under the Contract, or in connection in any way whatsoever with the contracted work.

1.8 The insurance coverage required shall remain in force throughout the Contract or as otherwise stated in the Contract Documents or these Insurance Requirements. If the Contractor fails to provide acceptable evidence of current insurance within seven (7) days of written notice at any time during the Contract, the County shall have the absolute right to terminate the Contract without any further obligation to the Contractor.

1.9 Contractual and other liability insurance provided under this Contract shall not contain a supervision, inspection or engineering services exclusion that would preclude the County from supervising or inspecting the work as to the end result. The Contractor shall assume all on-the-job responsibilities as to the control of persons directly employed by it and of the subcontractors and any persons employed by the subcontractor and/or carriers delivering and receiving materials from the Project.

1.10 If any policy contains a warranty stating that coverage is null and void (or words to that effect) if the Contractor does not comply with the most stringent regulations governing the work, such policy shall be modified so that coverage shall be afforded in all cases except for the Contractor's willful or intentional noncompliance with applicable government regulations.

1.11 All policies shall include the following language: "The insolvency or bankruptcy of the insured or of the insured's estate will not relieve the insurance company of its obligations under this policy."

1.12 All policy forms must "Pay on behalf of" rather than "Indemnify" the insured.

1.13 Nothing contained in these Insurance Requirements or the Contract Documents shall be construed as creating any contractual relationship between any subcontractor and the County. The Contractor

shall be as fully responsible to the County for the acts and omissions of its subcontractors and of persons employed by them as it is for acts and omissions of persons directly employed by it.

1.14 Precaution shall be exercised by the Contractor at all times for the protection of persons, (including employees) and property. All existing structures, utilities, roads, services, trees and shrubbery shall be protected against damage or interruption of service at all times by the Contractor and its subcontractors during the term of the Contract, and the Contractor shall be held responsible for any damage to property occurring by reason of its work under the Contract whether identified on the Contract Documents or not.

1.15 For any claims related to this work, The Contractor's insurance shall be deemed primary and non-contributory to all other applicable coverage and in particular with respect to Arlington County, its representatives, officials, employees, and agents. Any insurance or self-insurance maintained by Arlington County shall be excess and noncontributory of the Contractor's insurance. The Contractor shall waive its right of subrogation for all insurance claims.

1.16 If the Contractor does not meet the insurance requirements set forth by the Contract Documents, alternate insurance coverage or self-insurance, satisfactory to the Purchasing Agent, may be considered. Written requests for consideration of alternate coverages including the Contractor's most recent actuarial report and a copy of its self-insurance resolution to determine the adequacy of the insurance funding must be received by the County Purchasing Agent at least ten (10) working days prior to the date set for receipt of bids or proposals. If the County denies the request for alternate coverages, the specified coverages will be required to be submitted. If the County permits alternate coverage, an Addendum to the Insurance Requirements will be prepared and distributed prior to the time and date set for receipt of bids or proposals.

1.17 All required insurance coverages must be acquired from insurers authorized to do business in the Commonwealth of Virginia and acceptable to the County. The insurers must also have a policyholders' with a rating of "A-VII" in the latest edition of the A.M. Best Co.'s Insurance Reports, unless the County grants specific approval for an exception, in the same manner as described in 1.16 above.

1.18 The Contractor shall be responsible for payment of any deductibles applicable to the coverages.

1.19 The Contractor must disclose the amount of any deductible or self-insurance component applicable to the General Liability, Automobile Liability, Professional Liability, Intellectual Property or any other policies, if any. The County reserves the right to request additional information to determine if the Contractor has the financial capacity to meet its obligations under a deductible. Thereafter, at its option, the County may require a lower deductible, funds equal to the deductible be placed in escrow, a certificate of self-insurance, collateral, or other mechanism in the amount of the deductible to ensure additional protection for the County.

2. <u>Contractor's Insurance:</u>

2.1 The Contractor shall purchase the following insurance coverages, including the terms, provisions and limits shown in the Insurance Checklist.

2.1.1 Commercial General Liability - Such Commercial General Liability policy shall include any or all of the following as indicated on the Checklist:

i. General aggregate limit is to apply per project;

ii Premises/Operations;

iii. Actions of Independent Contractors;

iv. Products/Completed Operations to be maintained for five (5) years after completion of the Work;

v. Contractual Liability, including protection for the Contractor from claims arising out of liability assumed under this Contract;

vi. Personal Injury Liability including, including but not limited to, coverage for offenses related to employment and copyright infringement;

vii. Explosion, Collapse, or Underground (XCU) hazards.

2.1.2 Business Automobile Liability, including coverage for any owned, hired, or non-owned motor vehicles, Uninsured Motorists coverage, and automobile contractual liability.

2.1.3 Workers' Compensation - statutory benefits as required by Virginia law or the U.S. Longshoremen's and Harbor Workers' Compensation Act, or other laws as required by labor union agreements, including standard Other States coverage; Employers' Liability coverage. The policy shall not contain any provision or definition which would serve to eliminate third party action over claims, including exclusion for bodily injury to an employee of the insured, employees of the premises owner, or employees of the general contractor to which the insured is subcontracted; or employees of the insured's subcontractor.

2.2 The Contractor shall take reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to, its employees on the job, and others. The Contractor shall comply with all applicable provisions of federal, state and municipal safety laws, insurance requirement's, standard industry practices, the requirements of the operations and this contract, the Contractor, directly through its subcontractors, shall effect and properly maintain at all times, as required by the conditions and progress of the work, necessary safeguards for safety and protection of the public, including securing areas, posting danger signs, placarding, labeling or posting other forms of warning against hazards.

3. <u>Commercial General or other Liability Insurance - Claims-made Basis:</u>

3.1 If Commercial General or other liability insurance purchased by the Contractor has been issued on a claims-made basis, the Contractor must comply with the following additional conditions. The limits of liability and the extensions to be included as described in the Insurance Checklist remain the same. The Contractor must either:

i. Agree to provide insurance, copies of the endorsement and certified documentation evidencing the above coverages and naming the County as an additional insured for a period of five (5) years after final payment under the Contract. Such documentation shall evidence a retroactive date, no later than the beginning of the Contractors or subcontractors' work under this Contract, or

ii. Purchase an extended (minimum five [5] years) reporting period endorsement for the policy or policies in force during the term of this Contract and evidence the purchase of this extended reporting period endorsement by means of a copy of the endorsement itself. The extended reporting period will begin upon final payment under the Contract.

4. Builder's Risk Insurance

4.1 The Contractor shall purchase and maintain builders risk insurance with a limit equal to the initial Contract Amount and any amendments to the Contract which affect the project cost on a replacement cost basis. Builder's risk insurance shall be maintained until Final Payment under the Contract has been made or until no person or entity other than the County has an insurable interest in the covered property, whichever is earlier. The builders risk insurance shall include the County as defined in Section 1.6, Contractor, subcontractors and sub-subcontractors as named insureds.

4.2 Insurance shall be on an all-risks policy form including the perils of fire, theft, vandalism, malicious mischief, lightning, wind, force majeure, collapse, and earthquake. Coverage is to apply for demolition occasioned by enforcement of any applicable legal requirements, and Architect's fees. Coverage for the peril of flood shall not be required unless otherwise required in the Contract Documents.

4.3 Unless otherwise provided in the Contract Documents, the builders risk insurance shall also cover materials to be incorporated into the project which are stored off the site.

4.4 The Contractor shall purchase and maintain Boiler and Machinery insurance, if required by the contract documents or by law, with a limit satisfactory to the County. The Boiler and Machinery insurance shall cover objects during installation and until Final Acceptance by the County. The County shall be included as a named insured.

4.5 Any loss under builder's risk insurance shall be payable to the County as fiduciary for the insureds, as their interests may appear, subject to any mortgagee clause. The Contractor shall pay subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require subcontractors to make payments to their sub-subcontractors in similar manner. The County, as fiduciary, shall have the right to adjust and settle a loss with insurers.

4.6 The insurance company providing the builders risk coverage shall grant permission for the County to partially occupy or use the premises under construction prior to final acceptance without removing or affecting the coverage.

# V. ATTACHMENTS AND FORMS

**ARLINGTON COUNTY, VIRGINIA**
**OFFICE OF THE PURCHASING AGENT**

**INVITATION TO BID NO. 24-DES-ITBPW-432**

**BID FORM**

**ELECTRONIC BIDS WILL BE RECEIVED BY THE COUNTY VIA VENDOR REGISTRY NOT LATER THAN 2:00 P.M. ON WEDENESDAY, JANUARY 24TH**

FOR PROVIDING ELECTRIC PANELBOARD REPLACEMENT & INSTALLATION SERVICES IDENTIFIED HEREIN IN ACCORDANCE WITH THE DRAWINGS, SPECIFICATIONS, TERMS AND CONDITIONS OF THIS SOLICITATION

**THE FULL LEGAL NAME OF THE ENTITY SUBMITTING THIS BID MUST BE WRITTEN IN THE SPACE BELOW. THIS BID FORM AND ALL OTHER DOCUMENTS THAT REQUIRE A SIGNATURE MUST BE FULLY AND ACCURATELY COMPLETED AND SIGNED BY A PERSON WHO IS AUTHORIZED TO BIND THE BIDDER, OR THE BID MAY BE REJECTED.**

**SUBMITTED BY:**
*(legal name of entity)* _____

**AUTHORIZED SIGNATURE:** _____

**PRINT NAME AND TITLE:** _____

**ADDRESS:** _____

**CITY/STATE/ZIP:** _____

**TELEPHONE NO.:** _____ **E-MAIL ADDRESS:** _____

**THIS ENTITY IS INCORPORATED IN:** _____

**THIS ENTITY IS A:**
*(check the applicable option)*

| | | | |
|---|---|---|---|
| CORPORATION | ❑ | LIMITED PARTNERSHIP | ❑ |
| GENERAL PARTNERSHIP | ❑ | UNINCORPORATED ASSOCIATION | ❑ |
| LIMITED LIABILITY COMPANY | ❑ | SOLE PROPRIETORSHIP | ❑ |

**IS BIDDER AUTHORIZED TO TRANSACT BUSINESS IN THE COMMONWEALTH OF VIRGINIA?** YES ❑ NO ❑

**IDENTIFICATION NO. ISSUED TO THE ENTITY BY THE SCC:** _____

*Any Bidder exempt from Virginia State Corporation Commission (SCC) authorization requirement must include a statement with its bid explaining why it is not required to be so authorized.*

**VIRGINIA CONTRACTOR'S LICENSE NUMBER:** _____

**ENTITY'S DUN & BRADSTREET D-U-N-S NUMBER:** *(if available):* _____

| | | | | |
|---|---|---|---|---|
| **HAS YOUR FIRM OR ANY OF ITS PRINCIPALS BEEN DEBARRED, ENJOINED, OR SUSPENDED FROM SUBMITTING BIDS TO ARLINGTON COUNTY, VIRGINIA, OR ANY OTHER STATE OR POLITICAL SUBDIVISION WITHIN THE PAST THREE YEARS?** | YES | ❑ | NO | ❑ |
| **HAS YOUR FIRM DEFAULTED ON ANY PROJECT IN THE LAST THREE YEARS?** | YES | ❑ | NO | ❑ |
| **HAS YOUR FIRM HAD ANY TYPE OF BUSINESS, CONTRACTING OR TRADE LICENSE, REGISTRATION OR CERTIFICATION REVOKED OR SUSPENDED IN THE PAST THREE YEARS?** | YES | ❑ | NO | ❑ |
| **HAS YOUR FIRM AND ITS PRINCIPALS/OWNERS BEEN CONVICTED OF ANY CRIME RELATING TO ITS CONTRACTING BUSINESS IN THE PAST TEN YEARS?** | YES | ❑ | NO | ❑ |
| **HAS YOUR FIRM BEEN FOUND IN VIOLATION OF ANY LAW APPLICABLE TO ITS CONTRACTING BUSINESS (LICENSING LAWS, TAX LAWS, WAGE AND HOUR LAWS, PREVAILING WAGE LAWS, ENVIRONMENTAL) WHERE THE RESULT OF SUCH VIOLATION WAS THE PAYMENT OF A FINE, BACK PAY DAMAGES, OR ANY OTHER PENALTY IN THE AMOUNT OF $5000 OR MORE?** | YES | ❑ | NO | ❑ |
| **IS YOUR FIRM PREQUALIFIED BY THE VIRGINIA DEPT. OF TRANSPORTATION?** | YES | ❑ | NO | ❑ |

**BIDDER STATUS:** MINORITY OWNED: ❑ WOMAN OWNED: ❑ NEITHER: ❑

The undersigned certifies that (Bidder Name)_____is currently registered with the Virginia State Board of Contractors as required by the Code of Virginia. Certificate Number _____ for a Class_____ License was issued on the_____day of _____, 20____. The undersigned further certifies that the registration fee and all renewal fees required under law have been paid.

**TIME LIMIT FOR PROJECT:** SUBSTANTIAL COMPLETION – 540 **CALENDAR DAYS**
FINAL COMPLETION – 30 **CALENDAR DAYS** FROM SUBSTANTIAL COMPLETION

**LIQUIDATED DAMAGES:** SUBSTANTIAL COMPLETION - **$1340.00** PER DAY
FINAL COMPLETION - **$500.00** PER DAY

**MINIMUM BIDDER QUALIFICATIONS:**
**In a separate attachment, Bidders shall provide the following documentation:**
In order to be considered responsible and responsive Bidders shall have the experience described below, and provide the supporting documentation as instructed.

COMPANY QUALIFICATIONS:
Bidders shall have five [5] continuous years of experience conducting public works infrastructure and [electrical systems upgrades including panelboards and transformers replacement] projects. The experience shall be work of similar size and scope, construction, re-construction, and maintenance. The Bidder's obtained project experience shall consist of the following:

- Have completed at least three (3) electrical systems upgrade projects with a construction value of $700k or greater.
- Have completed a project that includes replacement of panelboards and/or transformers.
- Have completed similar electrical upgrade projects in occupied buildings, demonstrating the ability to manage projects while minimizing disruption to occupants' daily activities and ensuring their safety.

Bidders shall provide a list of three [3] similar projects recently completed projects that involving the same material, equal size, and comparable length. For each project, Bidders shall list the following information:

- Project Name
- Project description and Bidder's scope of work within the project
- Project manager's name, telephone number and email address
- Work start date, scheduled completion, and actual completion date
- Initial contract cost and final contract cost

The experience of the contractor owner(s) may be imputed to a newly formed company/Contractor provided the Contractor owner(s) has/have at least five (5) years of demonstrated experience of reliability and meets the criteria set forth herein.

STAFFING QUALIFICATIONS:

The Foreman/Superintendent/ Project Manager assigned to this work shall have at least four [4] years of experience in overseeing projects of similar type and size. Bidders shall submit the resume of the proposed Forman/Superintendent/Project Manager with their Bids.

**COMPLETE THE PRICING SHEET PROVIDED WITH THE BID DOCUMENTS AS ATTACHMENT A TO ITB NO. 24-DES-ITBPW-432 AND SUBMIT IT WITH YOUR BID.**

**FAILURE TO SUBMIT THE PRICING SHEET WITH THE BID WILL DEEM THE BIDDER NONRESPONSIVE.**

THE UNDERSIGNED UNDERSTANDS AND ACKNOWLEDGES THE FOLLOWING:

THE OFFICIAL COPY OF THE SOLICITATION DOCUMENTS, WHICH INCLUDES ANY ADDENDA, IS THE ELECTRONIC COPY THAT IS AVAILABLE FROM THE VENDOR REGISTRY WEBSITE AT: HTTPS://VRAPP.VENDORREGISTRY.COM/BIDS/VIEW/BIDSLIST?BUYERID=A596C7C4-0123-4202-BF15-3583300EE088.

VENDORS ARE REQUIRED TO REGISTER ON VENDOR REGISTRY IN ORDER TO SUBMIT A RESPONSE TO THIS INVITATION TO BID. **NO RESPONSES WILL BE ACCEPTED AFTER THE BID DUE DATE AND TIME**.

POTENTIAL BIDDERS ARE RESPONSIBLE FOR DETERMINING THE ACCURACY AND COMPLETENESS OF ALL SOLICITATION DOCUMENTS THEY RECEIVE FROM ANY SOURCE, INCLUDING THE COUNTY.

The undersigned acknowledges receipt of the following Addenda:

ADDENDUM NO. 1 DATE:_____ INITIAL:_____

ADDENDUM NO. 2 DATE:_____ INITIAL:_____

ADDENDUM NO. 3 DATE:_____ INITIAL:_____

TRADE SECRETS OR PROPRIETARY INFORMATION:
Trade secrets or proprietary information submitted by an Offeror in connection with a procurement transaction will not be subject to public disclosure under the Virginia Freedom of Information Act. Pursuant to Section 4-112 of the Arlington County Purchasing Resolution, however, an Offeror seeking to protect submitted data or materials from disclosure must, before or upon submission of the data or materials, identify the specific data or materials to be protected and state the reasons why protection is necessary. Please note that designation of an entire bid, proposal, or prequalification application or of line-item prices or the total bid amount is prohibited.

Please mark one:

- ❑ No, the bid that I have submitted does not contain any trade secrets and/or proprietary information.
- ❑ Yes, the bid that I have submitted does contain trade secrets and/or proprietary information.

If Yes, you must clearly identify below the exact data or materials to be protected and list all applicable page numbers, sections, and paragraphs of the bid that contain such data or materials:

_____

_____

_____

State the specific reason(s) why protection is necessary and why the identified information constitutes a trade secret or is proprietary:

_____

_____

_____

If you fail above to identify the data or materials to be protected or to state the reason(s) why protection is necessary, you will not have invoked the protection of Section 4-111 of the Purchasing Resolution. Accordingly, upon the award of a contract, the bid will be open for public inspection consistent with applicable law.

CERTIFICATION OF NON-COLLUSION: The undersigned certifies that this bid is not the result of or affected by (1) any act of collusion with another person engaged in the same line of business or commerce (as defined in Virginia Code §§ 59.1-68.6 *et seq*.) or (2) any act of fraud punishable under the Virginia Governmental Frauds Act (Virginia Code §§ 18.2-498.1 *et seq*.).

CONTACT PERSON AND MAILING ADDRESS FOR DELIVERY OF NOTICES

Provide the name and address of the person who is designated to receive notices and other communications regarding this solicitation. Refer to the "Notices" section in the draft Contract Terms and Conditions for information regarding delivery of notices.

NAME: _____

ADDRESS: _____

E-MAIL: _____

# INSURANCE CHECKLIST

**CERTIFICATE OF INSURANCE MUST SHOW ALL COVERAGE AND ENDORSEMENTS MARKED "X".**

**COVERAGES REQUIRED** **LIMITS (FIGURES DENOTE MINIMUMS)**

_X_ 1. **Workers' Compensation.....Statutory limits of Virginia**
_X_ **2. Employer's Liability.....$500,000/accident, $500,000/disease, $500,000/disease policy limit**
_X_ **3. Commercial General Liability…… $1,000,000 CSL BI/PD each occurrence, $2 Million annual aggregate**
_X_ 4. Premises/Operations……$1, Million CSL BI/PD each occurrence, $ 2 Million annual aggregate
_X_ 7. Independent Contractors……$1 million CSL BI/PD each occurrence, $2 Million annual aggregate
_X_ 8. Products Liability…… $1 million CSL BI/PD each occurrence, $2 Million annual aggregate
_X_ 9. Completed Operations…… $1 million CSL BI/PD each occurrence, $2 Million annual aggregate
_X_ 10. Contractual Liability (Must be shown on Certificate…. $1 million CSL BI/PD each occurrence, $2 Million annual aggregate
_X_ 11. Personal and Advertising Injury Liability.....$1 million each offense, $2 Million annual aggregate
__ 21. Moving and Rigging Floater.....Endorsement to CGL
_X_ 24. XCU Coverage.....Endorsement to CGL
_X_ 5. **Automobile Liability.....$1 million CSL BI/PD each accident, Uninsured Motorist**
_X_ 6. Owned/Hired/Non-Owned Vehicle.....$1 million BI/PD each accident, Uninsured Motorist
__ 16. Motor Carrier Act (MCS-90) and CA9948 (or equivalent) Endorsements .....$ 2 million BI/PD each accident, Uninsured Motorist
_X_ 12. **Umbrella/Excess Liability.....$1 million Bodily Injury, Property Damage and Personal Injury**
__ **13. Per Project Aggregate for __ General Liability or __ Umbrella/Excess Liability (check coverage)**
__ **14. Professional Liability/ Errors and Omission (E&O)**
__ a. Architects and Engineers.....$1 million per occurrence/claim
__ b. Asbestos Removal Liability .....$3 million per occurrence/claim
__ c. Medical Malpractice……..$2.55 million per occurrence/claim or the statutory VA annual claim cap whichever is greater
__ 15. Miscellaneous E&O.....$1 million per occurrence/claim

__ **17. Motor Cargo Insurance.....$ _____ (to the total value of the goods being transported)**
__ **18. Garage Liability.....$1 million Bodily Injury, Property Damage per occurrence**
__ **19. Garage Keepers Liability.....$1Million Comprehensive, $1 Million Collision**
__ **20. Inland Marine-Bailee's Insurance…….. $_____ (maximum value of goods under Contractor's care)**
__ **22. Crime Liability/ Employee Dishonesty insurance or Dishonesty Bond.....$_____**
(Maximum value of revenue or goods that can be taken at one time)
_X_ **23. Builder's Risk……$_____ (Provide Coverage in the full amount of contract)**
__ **25. USL&H.....Federal Statutory Limits**
_X_ **26. Carrier Rating shall be Best's Rating of A-VII or better or its equivalent**
_X_ **27. Notice of Cancellation, nonrenewal or material change in coverage shall be provided to County at least thirty (30) days prior to action.**
_X_ **28. The County shall be named Additional Insured on all policies except Workers Compensation, Errors, and Omissions/Professional Liability and auto.**
_X_ **29. Certificate of Insurance shall show Bid Number and Bid Title.**
__ **30. Environmental Impairment Liability, including coverage of on-site clean up……BI/PD $3 Million per occurrence or $6 Million Aggregate**
__ a. If work requires clean up, remediation, and/or removal of bio -solids, bio-hazards waste, and any hazardous or toxic material via transportation request Business Auto Liability add #16 from this checklist.
__ **31. Cyber insurance with Technology E&O…… $2 Million per occurrence**
__ **32. OTHER INSURANCE REQUIRED: _____**

**BIDDER'S STATEMENT:**
If awarded the contract, I will comply with contract insurance requirements.

BIDDERNAME: _____

AUTH. SIGNATURE: _____

**ATTACHMENT A - SCOPE OF WORK**
**ELECTRICAL PANEBOARD REPLACEMENT**

**Project Location:** Operations Control Building (OBC)
3402 S Glebe Rd, Arlington Virginia, 22202

**Background**
Arlington County Government is replacing 17 existing electrical panelboards and two transformers at the first, second, and third floors of the Operations Control Building (OCB) located at 3402 S Glebe Rd, Arlington Virginia, 22202. Additionally, new receptacles will be installed in the Lab on the third floor along with other works as indicated in the Contract documents.

**Objective**
The purpose of this project is to upgrade existing electrical infrastructure to meet current code requirements, safety, and capacity standards. This will also help to improve power distribution efficiency and reliability and to accommodate increased electrical demand by replacing the panels, transformers and adding additional receptacles.

**Scope**
Furnish all necessary equipment, materials, and manpower to carry out the tasks outlined in the scope of work. This includes replacing the electrical panelboards, transformers, and feeders, as well as installing new receptacles at OCB. It is crucial to note that this project is being conducted in an occupied building, and power outages will occur throughout the construction period. Therefore, all construction and installation activities must be organized in phases to reduce disruptions during the specified working hours mentioned in the Issued for Construction (IFC) Specification Document and drawings and the Contractor is required to supply alternative power during these interruptions as indicated in the Contract documents. The scope of work for this project encompasses the following:

**1. Permits**

The Contractor shall be solely responsible for thoroughly understanding, obtaining, and paying for all other permits requirement as it pertains to work under this Contract. All Permits obtained by the County are the responsibility of the Contractor to track and monitor for renewal. The Contractor will notify the County at least 30 days prior to the permit expiration date.

Permits required for this project may include some or all the following, but are not limited to:

1. Electrical Permit
2. Any other permits required by the Arlington County

All fees for County DES permits will be waived by Arlington County, and fees for non-County permits will be paid by Arlington County.

If any activities requiring welding or soldering a permit from Arlington County must be obtained. The permit shall include time frame for welding or soldering, certification of welder and method of odor and/or smoke mitigation. The permit shall be submitted for work no greater than 5 days in duration and shall be submitted a 3 day in advance of the associated work. If the welding requires the fire alarms to be

shut off, the contractor must supply fire watch services during the shutdown. The contractor shall receive written authorization for the permit from Arlington County prior to initiating work requiring the permit.

The Contractor shall be responsible for scheduling and coordinating inspections and receipts of local or state permits/approvals/certifications for any tanks, piping and associated appurtenances, which are constructed, installed tested or removed as part of this contract. See IFC Specification Document.

**2. Testing & Inspection**

It is the Contractor's responsibility to schedule all required testing and inspections with any of the appropriate parties. The Contractor is required to fully understand the County inspection process and is responsible for researching and obtaining all required permits and or non-permit reviews as identified by Arlington County Government. See ICF Specification Document for furthers details on required inspections and testing.

See also www.arlingtonva.us for applicable requirements.

**3. Contractor's Use of Site and Premises**

The Contractor's use of the premises is limited by the Owner's right to perform construction operations with its own forces or to employ separate contractors on portions of the project as indicated in the IFC Specification Document.

1. The County will allocate outdoor parking spaces to the Contractor for the purpose of storing material and equipment. These spaces lack weather protection and are not secure. It is the contractor's duty to ensure temporary shielding and protection during the period of use as a storage area.
2. Storage of equipment (either demolished or new units to be installed) shall not occur within occupied building space and shall be constrained to areas designated by the owner.
3. Keep the existing driveways, loading docks and entrances always serving the premises clear and available to the County and his/her employees. Do not use these areas for parking or storage of materials.
4. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and locations of storage sheds to the areas designated by the County. If additional storage is necessary, obtain and pay for such storage off site.
5. No use of county trash dumpsters shall be permitted.
6. Access to the facility and emergency egress doors shall be always accessible to the building occupants.

**4. Coordination with Occupants**

Full Owner Occupancy: As provided in the IFC Specification Document, owner will occupy project site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the work so as not to interfere with Owner's day-to-day operations.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.

2. Coordinate with Owner in advance of activities that will affect Owner's operations. Owner will determine amount of time required for notification prior to start of activities that will affect operations.
3. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

**4. Work Restrictions**

See the IFC Specification Document for restrictions on construction operations and working hours.

**5. Site Assessment**

1. Conduct a thorough assessment of the existing panelboards and transformers on the first, second, and third floors.
2. Evaluated the optimal locations of the panels and receptacles for the Lab on the first, second and third floors.

**6. Demolition and Removal**

Unless otherwise indicated, demolition and construction waste become property of the Contractor. See IFC Specification Document for salvaging nonhazardous demolition and construction waste, recycling nonhazardous demolition and construction waste, and disposing of nonhazardous demolition and construction waste.

1. Safely disconnect and remove the existing panels and transformers on all three floors.
2. Dispose of old equipment in accordance with environmental regulations.

**7. Electrical Panels Replacement**

1. Supply and install electrical panels as indicated in the IFC Specification Document, IFC drawings and Bidders' Pricing Sheet.
2. Ensure compliance with local electrical codes and regulations as indicated in the IFC Specification Document.
3. Label and document circuits for easy identification as indicated in the IFC Specification Document.

**8. Transformers Replacement**

1. Supply and install transformers with appropriate capacity for the load requirements as indicated in the IFC Specification Document, IFC drawings and Bidders' Pricing Sheet.
2. Ensure proper grounding and bonding as indicated in the IFC Specification Document and drawings.
3. The County will coordinate the power shutdown for the replacement of the transformers with the power utility (Dominion).

**9. New Receptacles Installation**

1. Supply and install receptacles as per code requirements indicated in the IFC Specification Document, IFC drawings and Bidders' Pricing Sheet.
2. Ensure proper wiring and grounding for each receptacle as indicated in the IFC Specification Document and IFC drawings.

**10. Testing and Commissioning**

1. Conduct comprehensive testing of all installed panels, transformers, and receptacles to ensure proper functionality as indicated in the IFC Specification Document.

2. Address and rectify any issues identified during testing.

**11. Clean Up and Restoration**

1. Remove any debris, equipment, and materials from the work area.
2. Restore the work area to its original condition, ensuring proper disposal of waste.

**12. Documentation**

1. Provide as-built drawings reflecting the final layout of panels, transformers, and receptacles.
2. Submit a comprehensive report detailing the project's execution, including testing results and any deviations from the original plan.

**13. Training and Handover**

1. Provide training to facility personnel on the operation and maintenance of the new electrical components.
2. Ensure that all necessary documentation and manuals are handed over to the Owner.

**14. Project Completion and Closeout**

1. Obtain final inspection and approval from relevant authorities and close the permits.
2. Provide a formal project completion report summarizing all activities and outcomes.
3. Comply with all required Closeout Procedures as indicated in the IFC Specification Document.

In taking into consideration operational requirements and minimizing disruptions during the business days and hours, the contractor is requested to consider working on weekends and after hours if required.

## ATTACHMENT F - CONTRACTOR PERFORMANCE EVALUATION FORM

ARLINGTON COUNTY GOVERNMENT

Contractor Performance Evaluation Form

Contractor Name:_____ Contract No.: _____

Date:_____ Project/Contract Name: _____

Interim Evaluation____ Final Evaluation _____

Scope of Work/Services Provided:

_____

_____

_____

_____

_____

Contract Start Date: _____/_____/____ Contract End Date: ___/____/____ Actual Completion Date: ___/___/_____

Please rate the effectiveness of the Contractor's performance on the Contract/Project across the following dimensions:

Evaluation Criteria: Unacceptable Poor Satisfactory Excellent

Written comments to explain assigned ratings are required for any performance ratings below "satisfactory" or an "excellent" in any category.

Evaluation Questions

1. Quality of Workmanship

Rate the quality of the Contractor's workmanship. Were there quality-related or workmanship problems on the Contract? Was the Contractor responsive to remedial work required?

____ Unacceptable ____ Poor ____ Satisfactory ____ Excellent ____ N/A

2. Problem Solving and Decision Making

Rate the Contractor's ability to provide effective and creative problem solving, coordination and fair decision making on Contract/Project.

____ Unacceptable ____ Poor ____ Satisfactory ____ Excellent ____ N/A

**Arlington County**
Electrical Panel Replacement at Operations and Control Building (OCB)

**DIVISION 1 – GENERAL REQUIREMENTS**

011000 Summary
012500 Substitution Procedures
013100 Project Management and Coordination
013300 Submittal Procedures
013516 Alteration Project Procedures
014000 Quality Requirements
014200 References
016000 Product Requirements
017300 Execution
017419 Construction Waste Management and Disposal
017700 Closeout Procedures
017823 Operation and Maintenance Data
017839 Project Record Documents
017900 Demonstration and Training

**DIVISION 7 – THERMAL AND MOISTURE PROTECTION**

078413 Penetration Firestopping

**DIVISION 26 – ELECTRICAL**

260010 Supplemental Requirements for Electrical
260519 Low-Voltage Electrical Power Conductors and Cables
260529 Hangers and Supports for Electrical Systems
260533 Raceway and Boxes for Electrical Systems
260544 Sleeves and Sleeve Seals for Electrical Raceways and Cabling
260553 Identification for Electrical Systems
260573.13 Short-Circuit Studies
260573.16 Coordination Studies
260573.19 Arc-Flash Hazard Analysis
262213 Low-Voltage Distribution Transformers
262416 Panelboards
262726 Wiring Devices

END OF TABLE OF CONTENTS

# SECTION 011000 - SUMMARY

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

.

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work performed by Owner.
5. Future work not part of this Project.
6. Owner-furnished/Contractor-installed (OFCI) products.
7. Contractor's use of site and premises.
8. Coordination with occupants.
9. Work restrictions.
10. Specification and Drawing conventions.
11. Miscellaneous provisions.

B. Related Requirements:
1. Section 017300 "Execution" for coordination of Owner-installed products.

### 1.3 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

### 1.4 PROJECT INFORMATION

A. Project Identification: Arlington County Electrical Panel Replacement at Operations and Control Building (OCB).

1. Project Location: 3402 South Glebe Rd, Arlington, Virginia 22202.

B. Owner: Arlington County Water Pollution Control Bureau

C. Owner's Representative: Mary Strawn
1. E-mail: mstrawn@arlingtonva.us

2. Phone: (703) 228-6859

3. Engineer: Whitman, Requardt & Associates, LLP.

4. Engineer's Representative: Il Kim – Project Manager
   a. E-mail: ikim@wrallp.com
   b. Phone: (443) 224-1629

## 1.5 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. Replacement of existing panels and transformers at the first, second and third floor of the Operations and Control Building (OCB). In addition, new receptacles will be provided at the Lab on the third floor along with other Work as indicated in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

## 1.6 WORK PERFORMED BY OWNER

A. Cooperate fully with Owner, so work may be carried out smoothly, without interfering with or delaying Work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

## 1.7 CONTRACTOR'S USE OF SITE AND PREMISES

A. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits on Use of Site: Confine construction operations to Electrical rooms on first, second and third floors; lab and lobby space on third floor; and Pilot Room.
2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

   a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

## 1.8 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy Project site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Coordinate with Owner in advance of activities that will affect Owner's operations. Owner will determine amount of time required for notification prior to start of activities that will affect operations.

## 1.9 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to between 7:00 a.m. to 6:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.

1. Weekend Hours: As approved by Arlington County.
2. Early Morning Hours: As permitted by Arlington County.
3. Hours for Utility Shutdowns: As approved by Arlington County. Typically, utility shutdowns shall occur after 4:00pm on weekdays. Coordinate with Owner in advance of utility shutdowns and provide length of notice as directed.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:

1. Notify Owner not less than fourteen days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.

1. Coordinate with Owner to determine required notification period in advance of proposed disruptive operations. Notify Owner accordingly in advance of proposed disruptive operations.

2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Owner's property is not permitted.

F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

H. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

I. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

J. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

K. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

# SECTION 012500 - SUBSTITUTION PROCEDURES

## 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
   1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

## 1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

## 1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

   1. Substitution Request Form: Use form acceptable to Engineer.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

      a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
      b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific

features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of Engineers and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

   a. Forms of Acceptance: Change Order, Construction Change Directive, or Engineer's Supplemental Instructions for minor changes in the Work.
   b. Use product specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.

## 1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

## 1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

# SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Web-based Project management software package.
6. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
2. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

### 1.3 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner, Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

### 1.4 WEB-BASED PROJECT MANAGEMENT SOFTWARE PACKAGE

A. Arlington County utilizes e-Builder construction management cloud-based software. Each contractor shall use this management system for submittals, RFI’s, project scheduling, etc.

## 1.5 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and in prominent location in built facility. Keep list current at all times.

## 1.6 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Coordination of Multiple Contracts: Each contractor shall cooperate with Project coordinator, who shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its own operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and scheduled activities of other contractors and direction of Project coordinator to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

## 1.7 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of Engineerural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Engineer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:

    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Engineer will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Engineer determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Engineer will so inform Contractor, who shall make suitable modifications and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

C. Coordination Drawing Process: Prepare coordination drawings in the following manner:
1. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.

2. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
3. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Engineer to review and resolve conflicts on the coordination drawings.

D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format:

   a. Same digital data software program, version, and operating system as original Drawings.

2. Engineer will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

   a. Engineer makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
   b. Digital Data Software Program: Drawings are available in Autocad 2020.
   c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Engineer].

## 1.8 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Engineer will return without response those RFIs submitted to Engineer by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner name.
3. Owner's Project number.
4. Name of Engineer and Construction Manager.
5. Engineer's Project number.
6. Date.
7. Name of Contractor.
8. RFI number, numbered sequentially.
9. RFI subject.
10. Specification Section number and title and related paragraphs, as appropriate.
11. Drawing number and detail references, as appropriate.
12. Field dimensions and conditions, as appropriate.

13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
14. Contractor's signature.
15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Engineer.

1. Attachments shall be electronic files in PDF format.

D. Engineer's and Construction Manager's Action: Engineer and Construction Manager will review each RFI, determine action required, and respond. Allow three days for Engineer's response for each RFI. RFIs received by Engineer or Construction Manager after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Engineer's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt by Engineer **or** Construction Manager of additional information.
3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer and Construction Manager in writing within 5 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following

1. Project name.
2. Name and address of Contractor.
3. Name and address of Engineer and Construction Manager.
4. RFI number, including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.

7. Date Engineer's and Construction Manager's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

F. On receipt of Engineer's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer and Construction Manager within three days if Contractor disagrees with response.

## 1.9 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Engineer's Digital Data Files: Digital data files of Engineer's CAD drawings will be provided by Engineer for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
2. Engineer makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Digital Drawing Software Program: Contract Drawings are available in Autocad 2020.
4. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Engineer.

    a. Subcontractors and other parties granted access by Contractor to Engineer's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Engineer.
5. The following digital data files will be furnished for each appropriate discipline:

    a. Floor plans.
    b. Details
    c. One Line Diagrams.
    d. Schedule sheets.

B. PDF Document Preparation: Where PDFs are required to be submitted to Engineer, prepare as follows:

1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

## 1.10 PROJECT MEETINGS

A. General: Construction Manager will schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times a minimum of seven days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Engineer, within three days of the meeting.

B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Construction Manager, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Responsibilities and personnel assignments.
    b. Tentative construction schedule.
    c. Phasing.
    d. Critical work sequencing and long lead items.
    e. Designation of key personnel and their duties.
    f. Lines of communications.
    g. Use of web-based eBuilder Project software.
    h. Procedures for processing field decisions and Change Orders.
    i. Procedures for RFIs.
    j. Procedures for testing and inspecting.
    k. Procedures for processing Applications for Payment.
    l. Distribution of the Contract Documents.
    m. Submittal procedures.
    n. Sustainable design requirements.
    o. Preparation of Record Documents.
    p. Use of the premises and existing building.
    q. Work restrictions.
    r. Working hours.
    s. Owner's occupancy requirements.
    t. Responsibility for temporary facilities and controls.
    u. Procedures for moisture and mold control.
    v. Procedures for disruptions and shutdowns.
    w. Construction waste management and recycling.
    x. Parking availability.
    y. Office, work, and storage areas.
    z. Equipment deliveries and priorities.
    aa. First aid.
    bb. Security.
    cc. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.

1. Attendees: 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 Engineerand Construction Manager of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Sustainable design requirements.
    i. Review of mockups.
    j. Possible conflicts.
    k. Compatibility requirements.
    l. Time schedules.
    m. Weather limitations.
    n. Manufacturer's written instructions.
    o. Warranty requirements.
    p. Compatibility of materials.
    q. Acceptability of substrates.
    r. Temporary facilities and controls.
    s. Space and access limitations.
    t. Regulations of authorities having jurisdiction.
    u. Testing and inspecting requirements.
    v. Installation procedures.
    w. Coordination with other work.
    x. Required performance results.
    y. Protection of adjacent work.
    z. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Construction Manager will schedule and conduct a project closeout conference, at a time convenient to Owner and Engineer, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Construction Manager, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of Record Documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Procedures for completing and archiving web-based Project software site data files.
    d. Submittal of written warranties.
    e. Requirements for preparing operations and maintenance data.
    f. Requirements for delivery of material samples, attic stock, and spare parts.
    g. Requirements for demonstration and training.
    h. Preparation of Contractor's punch list.
    i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    j. Submittal procedures.
    k. Coordination of separate contracts.
    l. Owner's partial occupancy requirements.
    m. Installation of Owner's furniture, fixtures, and equipment.
    n. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Construction Manager will conduct progress meetings at bi-weekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Construction Manager, and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for three weeks ahead.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Status of sustainable design documentation.
6) Deliveries.
7) Off-site fabrication.
8) Access.
9) Site use.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of RFIs.
16) Status of Proposal Requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Coordination Meetings: Construction Manager will conduct Project coordination meetings on an as needed basis or as directed by Owner. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, Construction Manager, and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site use.
9) Temporary facilities and controls.
10) Work hours.
11) Hazards and risks.
12) Progress cleaning.
13) Quality and work standards.
14) Status of RFIs.
15) Proposal Requests.
16) Change Orders.
17) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

# SECTION 013300 - SUBMITTAL PROCEDURES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
2. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
3. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
4. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
5. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
6. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

### 1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Owner and/or Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Owner and/or Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

### 1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Owner and/or Engineer and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Owner and/or Engineer's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled date of fabrication.
    i. Scheduled dates for installation.
    j. Activity or event number.

## 1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Engineer.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.
7. Names of subcontractor, manufacturer, and supplier.
8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
9. Category and type of submittal.
10. Submittal purpose and description.
11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
12. Drawing number and detail references, as appropriate.
13. Indication of full or partial submittal.
14. Location(s) where product is to be installed, as appropriate.
15. Other necessary identification.
16. Remarks.
17. Signature of transmitter.

B. Options: Identify options requiring selection by Engineer.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Owner and/or Engineer on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

## 1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
   a. eBuilder cloud-based construction management software is utilized by Owner and shall be used for submission, review and tracking of submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

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

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. [Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Engineer's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Engineer and to Engineer's consultants, allow 15 days for review of each submittal. Submittal will be returned to [Engineer before being returned to Contractor.

    a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Engineer.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

## 1.6 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

C. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Engineers and owners, and other information specified.

E. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

F. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

G. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

## 1.7 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

## 1.8 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Engineer will not review submittals received from Contractor that do not have Contractor's review and approval.

## 1.9 ENGINEER'S REVIEW

A. Action Submittals: Engineer will review each submittal, indicate corrections or revisions required**, and return**.

1. PDF Submittals: Engineer will indicate, via markup on each submittal, the appropriate action

B. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Engineer will discard submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Engineer without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

# SECTION 013516 - ALTERATION PROJECT PROCEDURES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes special procedures for alteration work.

### 1.2 DEFINITIONS

A. Consolidate: To strengthen loose or deteriorated materials in place.

B. Design Reference Sample: A sample that represents the Architect's pre=bid selection of work to be matched; it may be existing work or work specially produced for the Project.

C. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

D. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.

E. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.

F. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.

G. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.

H. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.

I. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.

J. Retain: To keep an element or detail secure and intact.

K. Strip: To remove existing finish down to base material unless otherwise indicated.

### 1.3 COORDINATION

A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.

1. Schedule construction operations in sequence required to obtain best Work results.
2. Coordinate sequence of alteration work activities to accommodate the following:

    a. Owner's continuing occupancy of portions of existing building.
    b. Owner's partial occupancy of completed Work.
    c. Other known work in progress.
    d. Tests and inspections.

3. Detail sequence of alteration work, with start and end dates.
4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
5. Use of elevator and stairs.
6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.

B. Pedestrian and Vehicular Circulation: Coordinate alteration work with circulation patterns within Project building(s) and site. Some work is near circulation patterns. Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Access to restricted areas may not be obstructed. Plan and execute the Work accordingly.

## 1.4 PROJECT MEETINGS FOR ALTERATION WORK

A. Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site.

1. Attendees: In addition to representatives of Owner, Construction Manager**,** Engineer, and Contractor, testing service representative, specialists, and chemical-cleaner manufacturer(s) shall be represented at the meeting.
2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:

    a. Alteration Work Subschedule: Discuss and finalize; verify availability of materials, specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Fire-prevention plan.
    c. Governing regulations.
    d. Areas where existing construction is to remain and the required protection.
    e. Hauling routes.
    f. Sequence of alteration work operations.
    g. Storage, protection, and accounting for salvaged and specially fabricated items.
    h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
    i. Qualifications of personnel assigned to alteration work and assigned duties.
    j. Requirements for extent and quality of work, tolerances, and required clearances.
    k. Embedded work such as flashings and lintels, special details, collection of waste, protection of occupants and the public, and condition of other construction that affects the Work or will affect the work.

3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.

B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at weekly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, Construction Manager**,** Engineer, and Contractor, each specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of alteration work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to alteration work.
2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.

a. Alteration Work Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
b. Schedule Updating: Revise Contractor's Alteration Work Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
c. Review present and future needs of each entity present, including review items listed in the "Preliminary Conference for Alteration Work" Paragraph in this article and the following:

1) Interface requirements of alteration work with other Project Work.
2) Status of submittals for alteration work.
3) Access to alteration work locations.
4) Effectiveness of fire-prevention plan.
5) Quality and work standards of alteration work.
6) Change Orders for alteration work.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

## 1.5 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.

1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to Owner where directed at Project site.

1.6 INFORMATIONAL SUBMITTALS

A. Alteration Work Subschedule:

1. Submit alteration work subschedule within 30 days of date established for commencement of alteration work.

B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.

C. Alteration Work Program: Submit 30 days before work begins.

D. Fire-Prevention Plan: Submit 30 days before work begins.

1.7 QUALITY ASSURANCE

A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.

1. Field Supervisor Qualifications: Full-time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on-site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.

B. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a "Lead-Safe Certified Firm" according to 40 CFR 745, Subpart E, and use only workers that are trained in lead-safe work practices.

C. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.

1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

D. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.

E. Safety and Health Standard: Comply with ANSI/ASSP A10.6.

## 1.8 STORAGE AND HANDLING OF SALVAGED MATERIALS

A. Salvaged Materials:

1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area **[**designated by Owner.
5. Protect items from damage during transport and storage.

B. Salvaged Materials for Reinstallation:

1. Repair and clean items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.

1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft.
3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F (3 deg C) or more above the dew point.

E. Storage Space:

1. Owner will arrange for limited on-site location(s) for free storage of salvaged material. This storage space includes security for stored material.
2. Arrange for off-site locations for storage and protection of salvaged material that cannot be stored and protected on-site.

1.9 FIELD CONDITIONS

A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of measured drawingsand preconstruction photographs.

B. Discrepancies: Notify Engineer of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

C. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by 12 inches (300 mm) or more.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.

1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
3. Erect temporary barriers to form and maintain fire-egress routes.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.

B. Temporary Protection of Materials to Remain:

1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.

C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

D. Utility and Communications Services:

1. Notify Owner, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

E. Existing Drains: Prior to the start of work in an area, test drainage system (where applicable) to ensure that it is functioning properly. Notify Owner immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.

1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

## 3.2 PROTECTION FROM FIRE

A. General: Follow fire-prevention plan and the following:

1. Comply with NFPA 241 requirements unless otherwise indicated
2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.

    a. If combustible material cannot be removed, provide fire blankets to cover such materials.

B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:

1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Obtain Hot Work Permit issued by Owner prior to proceeding with work.
2. Notify Owner at least 72 hours before each occurrence, indicating location of such work. Owner issued Hot Work Permit shall only be valid for one day of work. Coordinate Hot Work Permits in advance of notification.
3. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
4. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
5. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.

6. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
7. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:

    a. Train each fire watch in the proper operation of fire-control equipment and alarms.
    b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
    c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
    d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
    e. Maintain fire-watch personnel at each area of Project site until two hours after conclusion of daily work.

C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.

D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.

    1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

## 3.3 PROTECTION DURING APPLICATION OF CHEMICALS

A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.

B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.

C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.

D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.

E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL ALTERATION WORK

A. Have specialty work performed only by qualified specialists.

B. Ensure that supervisory personnel are present when work begins and during its progress.

C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs.

D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.

E. Notify Owner and Engineer of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.

1. Do not proceed with the work in question until directed by Owner and Engineer.

END OF SECTION 013516

# SECTION 014000 - QUALITY REQUIREMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

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

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Engineer, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

### 1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance

with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

H. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Engineer or Construction Manager.

## 1.4 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

## 1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Engineer regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Engineer for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

## 1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

F. Reports: Prepare and submit certified written reports and documents as specified.

G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

## 1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Engineer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Engineer has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

## 1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.

5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

## 1.9 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.

1. Requirements of authorities having jurisdiction supersede requirements for specialists.

G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:

1. Provide test specimens representative of proposed products and construction.
2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
4. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer through Construction Manager, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.

a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Engineer**,** Construction Manager**,** and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Engineer**,** Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
2. Distribution: Distribute schedule to Owner, Engineer, Construction Manager**,** testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

## 1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Engineer, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Engineer through Construction Manager with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Engineer.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's, Construction Manager's and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

# SECTION 014200 - REFERENCES

## PART 1 - GENERAL

### 1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

### 1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

## 1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.]The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; (See FGIA).
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.plib.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.

33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASSP - American Society of Safety Professionals (The); www.assp.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AVIXA - Audiovisual and Integrated Experience Association; (Formerly: Infocomm International); www.avixa.org.
38. AWEA - American Wind Energy Association; www.awea.org.
39. AWI - Architectural Woodwork Institute; www.awinet.org.
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
41. AWPA - American Wood Protection Association; www.awpa.com.
42. AWS - American Welding Society; www.aws.org.
43. AWWA - American Water Works Association; www.awwa.org.
44. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
45. BIA - Brick Industry Association (The); www.gobrick.com.
46. BICSI - BICSI, Inc.; www.bicsi.org.
47. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
48. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
49. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
50. CDA - Copper Development Association; www.copper.org.
51. CE - Conformite Europeenne; www.ec.europa.eu/growth/single-market/ce-marking.
52. CEA - Canadian Electricity Association; www.electricity.ca.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.compositepanel.org.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csa-group.org.
65. CSI - Cast Stone Institute; www.caststone.org.
66. CSI - Construction Specifications Institute (The); www.csiresources.org.
67. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
68. CTA - Consumer Technology Association; www.cta.tech.
69. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.coolingtechnology.org.
70. CWC - Composite Wood Council; (See CPA).
71. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
72. DHA - Decorative Hardwoods Association; (Formerly: Hardwood Plywood & Veneer Association); www.decorativehardwoods.org.
73. DHI - Door and Hardware Institute; www.dhi.org.
74. ECA - Electronic Components Association; (See ECIA).
75. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
76. ECIA - Electronic Components Industry Association; www.ecianow.org.
77. EIA - Electronic Industries Alliance; (See TIA).

78. EIMA - EIFS Industry Members Association; www.eima.com.
79. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
80. EOS/ESD Association; (Electrostatic Discharge Association); www.esda.org.
81. ESTA - Entertainment Services and Technology Association; (See PLASA).
82. ETL - Intertek (See Intertek); www.intertek.com.
83. EVO - Efficiency Valuation Organization; www.evo-world.org.
84. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
85. FGIA - Fenestration and Glazing Industry Alliance; https://fgiaonline.org.
86. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
87. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
88. FM Approvals - FM Approvals LLC; www.fmapprovals.com.
89. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
90. FRSA - Florida Roofing, Sheet Metal Contractors Association, Inc.; www.floridaroof.com.
91. FSA - Fluid Sealing Association; www.fluidsealing.com.
92. FSC - Forest Stewardship Council U.S.; www.fscus.org.
93. GA - Gypsum Association; www.gypsum.org.
94. GANA - Glass Association of North America; (See NGA).
95. GS - Green Seal; www.greenseal.org.
96. HI - Hydraulic Institute; www.pumps.org.
97. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
98. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
99. HPVA - Hardwood Plywood & Veneer Association; (See DHA).
100. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
101. IAS - International Accreditation Service; www.iasonline.org.
102. ICBO - International Conference of Building Officials; (See ICC).
103. ICC - International Code Council; www.iccsafe.org.
104. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
105. ICPA - International Cast Polymer Association; www.theicpa.com.
106. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
107. IEC - International Electrotechnical Commission; www.iec.ch.
108. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
109. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
110. IESNA - Illuminating Engineering Society of North America; (See IES).
111. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
112. IGMA - Insulating Glass Manufacturers Alliance; (See FGIA).
113. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.org.
114. II - Infocomm International; (See AVIXA).
115. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
116. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
117. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
118. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
119. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
120. ISO - International Organization for Standardization; www.iso.org.
121. ISSFA - International Solid Surface Fabricators Association; (See ISFA).

122. ITU - International Telecommunication Union; www.itu.int.
123. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
124. LMA - Laminating Materials Association; (See CPA).
125. LPI - Lightning Protection Institute; www.lightning.org.
126. MBMA - Metal Building Manufacturers Association; www.mbma.com.
127. MCA - Metal Construction Association; www.metalconstruction.org.
128. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
129. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
130. MHI - Material Handling Industry; www.mhi.org.
131. MIA - Marble Institute of America; (See NSI).
132. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
133. MPI - Master Painters Institute; www.paintinfo.com.
134. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
135. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
136. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
137. NADCA - National Air Duct Cleaners Association; www.nadca.com.
138. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
139. NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
140. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
141. NBI - New Buildings Institute; www.newbuildings.org.
142. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
143. NCMA - National Concrete Masonry Association; www.ncma.org.
144. NEBB - National Environmental Balancing Bureau; www.nebb.org.
145. NECA - National Electrical Contractors Association; www.necanet.org.
146. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
147. NEMA - National Electrical Manufacturers Association; www.nema.org.
148. NETA - InterNational Electrical Testing Association; www.netaworld.org.
149. NFHS - National Federation of State High School Associations; www.nfhs.org.
150. NFPA - National Fire Protection Association; www.nfpa.org.
151. NFPA - NFPA International; (See NFPA).
152. NFRC - National Fenestration Rating Council; www.nfrc.org.
153. NGA - National Glass Association (The); (Formerly: Glass Association of North America); www.glass.org.
154. NHLA - National Hardwood Lumber Association; www.nhla.com.
155. NLGA - National Lumber Grades Authority; www.nlga.org.
156. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
157. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
158. NRCA - National Roofing Contractors Association; www.nrca.net.
159. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
160. NSF - NSF International; www.nsf.org.
161. NSI - National Stone Institute; (Formerly: Marble Institute of America); www.naturalstoneinstitute.org.
162. NSPE - National Society of Professional Engineers; www.nspe.org.
163. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
164. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
165. NWFA - National Wood Flooring Association; www.nwfa.org.
166. NWRA - National Waste & Recycling Association; www.wasterecycling.org

167. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
168. PDI - Plumbing & Drainage Institute; www.pdionline.org.
169. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
170. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
171. RFCI - Resilient Floor Covering Institute; www.rfci.com.
172. RIS - Redwood Inspection Service; www.redwoodinspection.com.
173. SAE - SAE International; www.sae.org.
174. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
175. SDI - Steel Deck Institute; www.sdi.org.
176. SDI - Steel Door Institute; www.steeldoor.org.
177. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
178. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
179. SIA - Security Industry Association; www.siaonline.org.
180. SJI - Steel Joist Institute; www.steeljoist.org.
181. SMA - Screen Manufacturers Association; www.smainfo.org.
182. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
183. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
184. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
185. SPIB - Southern Pine Inspection Bureau; www.spib.org.
186. SPRI - Single Ply Roofing Industry; www.spri.org.
187. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
188. SSINA - Specialty Steel Industry of North America; www.ssina.com.
189. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
190. STI - Steel Tank Institute; www.steeltank.com.
191. SWI - Steel Window Institute; www.steelwindows.com.
192. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
193. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
194. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
195. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
196. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
197. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
198. TMS - The Masonry Society; www.masonrysociety.org.
199. TPI - Truss Plate Institute; www.tpinst.org.
200. TPI - Turfgrass Producers International; www.turfgrasssod.org.
201. TRI - Tile Roofing Institute; www.tileroofing.org.
202. UL - Underwriters Laboratories Inc.; www.ul.com.
203. UL LLC - UL LLC; www.ul.com.
204. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
205. USAV - USA Volleyball; www.usavolleyball.org.
206. USGBC - U.S. Green Building Council; www.usgbc.org.
207. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
208. WA - Wallcoverings Association; www.wallcoverings.org.
209. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
210. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
211. WDMA - Window & Door Manufacturers Association; www.wdma.com.

212. WI - Woodwork Institute; www.wicnet.org.
213. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
214. WWPA - Western Wood Products Association; www.wwpa.org.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.govinfo.gov.

2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.

6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

# SECTION 016000 - PRODUCT REQUIREMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
2. Section 012100 "Allowances" for products selected under an allowance.
3. Section 012500 "Substitution Procedures" for requests for substitutions.
4. Section 014200 "References" for applicable industry standards for products specified.
5. Section 017700 "Closeout Procedures" for submitting warranties.

### 1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products**.**

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

## 1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Resolution of Compatibility Disputes between Multiple Contractors:

a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Engineer will determine which products shall be used.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

    a. Name of product and manufacturer.
    b. Model and serial number.
    c. Capacity.
    d. Speed.
    e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

## 1.5 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

## 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.

5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

## 1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

# PART 2 - PRODUCTS

## 2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Engineer will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

    a. Submit additional documentation required by Engineer through Construction Manager in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Engineer, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.

    a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.

    a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with

requirements. Comparable products or substitutions for Contractor's convenience will be considered.

a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require the phrase "match Engineer's sample," provide a product that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Engineer from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Engineer will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects, with project names and addresses and names and addresses of Engineers and owners, if requested.
5. Samples, if requested.

B. Engineer's Action on Comparable Products Submittal: If necessary, Engineer will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."

1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
2. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by the Engineer of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

D. Submittal Requirements, Single-Step Process: When acceptable to Engineer, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Engineer of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

# SECTION 017300 - EXECUTION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner's portion of the Work.
6. Coordination of Owner-installed products.
7. Progress cleaning.
8. Starting and adjusting.
9. Protection of installed construction.
10. Correction of the Work.

B. Related Requirements:

1. Section 011000 "Summary" for coordination of Owner-furnished products, Owner-performed work, Owner's separate contracts, and limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
4. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

### 1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

### 1.3 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.

1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Engineer and Construction Manager of scheduled meeting.

Require representatives of each entity directly concerned with cutting and patching to attend, including the following:

a. Contractor's superintendent.
b. Trade supervisor responsible for cutting operations.
c. Trade supervisor(s) responsible for patching of each type of substrate.
d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.

2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Cutting and Patching Plan: Submit plan describing procedures at least **10**days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

## 1.5 QUALITY ASSURANCE

A. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Engineer of locations and details of cutting and await directions from Engineer before proceeding. Shore, brace, and support structural elements during cutting

and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Fire separation assemblies.
    b. Air or smoke barriers.
    c. Fire-suppression systems.
    d. Plumbing piping systems.
    e. Mechanical systems piping and ducts.
    f. Control systems.
    g. Communication systems.
    h. Fire-detection and -alarm systems.
    i. Conveying systems.
    j. Electrical wiring systems.
    k. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Sprayed fire-resistive material.
    e. Equipment supports.
    f. Piping, ductwork, vessels, and equipment.
    g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Engineer for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems**,** and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
2. List of detrimental conditions, including substrates.

3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

## 3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Engineer through Construction Manager in accordance with requirements in Section 013100 "Project Management and Coordination."

## 3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Engineer promptly.

B. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

C. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer.

## 3.4 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Engineer. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Engineer. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective or nonconforming Work.
1. Comply with Section 017700 “Closeout Procedures” for repairing or removing and replacing defective Work.

## 3.5 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Engineer. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

## 3.6 COORDINATION OF OWNER'S PORTION OF THE WORK

A. Site Access: Provide access to Project site for Owner's construction personnel and Owner's separate contractors.

1. Provide temporary facilities required for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products.
2. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and Owner's separate contractors.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel and Owner's separate contractors at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

   a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

## 3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

## 3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

## 3.10 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

# SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

### 1.3 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.

C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner’s property.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

### 1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

## 1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within **7** days of date established for the Notice to Proceed.

## 1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons (tonnes).
4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Qualification Data: For waste management coordinator.

## 1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may serve as Waste Management Coordinator.

B. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

## 1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste**.** Indicate quantities by weight or volume but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 50percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.

5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

F. Plumbing Fixtures: Separate by type and size.

G. Lighting Fixtures: Separate lamps by type and protect from breakage.

H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

## 3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

## 3.4 RECYCLING DEMOLITION WASTE

A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 1-inch size.

B. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 1-inch size.

2. Clean and stack undamaged, whole masonry units on wood pallets.

C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

D. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

E. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

F. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

G. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.

H. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.

I. Conduit: Reduce conduit to straight lengths and store by material and size.

J. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

## 3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

D. Paint: Seal containers and store by type.

## 3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

END OF SECTION 017419

# SECTION 017700 - CLOSEOUT PROCEDURES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Requirements:
1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

### 1.3 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Engineer's use prior to Engineer's inspection, to determine if the Work is substantially complete.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

### 1.5 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest-control inspection.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

## 1.7 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.

5. Submit testing, adjusting, and balancing records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

## 1.8 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
2. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
3. Submit pest-control final inspection report.
4. Submit Final Completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Engineer
d. Name of Contractor.
e. Page number.

4. Submit list of incomplete items in the following format:

a. MS Excel Electronic File: Engineer will return annotated file.
b. PDF Electronic File: Engineer will return annotated file.

1.10 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit on digital media acceptable to Engineer.

E. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark 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 Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Remove tools, construction equipment, machinery, and surplus material from Project site.
d. Clean exposed interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition.
e. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
f. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
g. Vacuum and mop concrete.

h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
n. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste-disposal requirements in Section 017419 "Construction Waste Management and Disposal."

## 3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

# SECTION 017823 - OPERATION AND MAINTENANCE DATA

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

B. Related Requirements:
1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

### 1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

### 1.4 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Engineer will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit via eBuilder cloud-based construction management system to sEngineer. Enable reviewer comments on draft submittals.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Engineer will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Engineer will return copy with comments.

1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within 15 days of receipt of Engineer's comments and prior to commencing demonstration and training.

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

## 1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

## 1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.

5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Engineer.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

## 1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

## 1.8 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

## 1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

## 1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent,

and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

# SECTION 017839 - PROJECT RECORD DOCUMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.

B. Related Requirements:
1. Section 017700 "Closeout Procedures" for general closeout procedures.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

### 1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

a. Final Submittal:
1) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.

### 1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.

d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
7.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

# SECTION 017900 - DEMONSTRATION AND TRAINING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

### 1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For facilitator.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

### 1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Preconstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

## 1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

## 1.6 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.

2. Documentation: Review the following items in detail:

   a. Emergency manuals.
   b. Systems and equipment operation manuals.

c. Systems and equipment maintenance manuals.
d. Product maintenance manuals.
e. Project Record Documents.
f. Identification systems.
g. Warranties and bonds.
h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.

f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

## 1.7 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

## 1.8 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

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1. Engineer will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral performance-based test.

F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900

# SECTION 078413 - PENETRATION FIRESTOPPING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

1. Penetration firestopping systems for the following applications:

a. Penetrations in fire-resistance-rated walls.
b. Penetrations in horizontal assemblies.

B. PREINSTALLATION MEETINGS

1. Preinstallation Conference: Conduct conference at Project site.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

### 1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."
3) FM Approval in its "Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration

firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.

D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

E. Manufactured Piping Penetration Firestopping System: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
4. Sleeve: Molded-PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A48/A48M, gray-iron, hubless-pattern wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

## 2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

## 2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

## 3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

## 3.5 FIELD QUALITY CONTROL

If required, inspection of penetration firestopping systems in this article is performed according to ASTM E2174, "On-Site Inspection of Installed Fire Stops." To prevent conflicts of interest, ASTM E2174 precludes making Contractor responsible for engaging the testing agency. Inspectors may verify compliance by destructive examination of some completed installations.

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

## 3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial

Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

## 3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Penetration Firestopping Systems with No Penetrating Items:
   1. F-Rating: 1 hour or 2 hours.
   2. T-Rating: 1 hour or 2 hours.
   3. W-Rating: No leakage of water at completion of water leakage testing.
   4. Type of Fill Materials: As required to achieve rating.

C. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing Retain one or more of first three subparagraphs below if required. If retaining first subparagraph, retain one alpha-alpha option followed by either a four-digit number or range of four-digit numbers from 1001 to 1999. See Evaluations for explanation of UL-system numbers.

   1. F-Rating: 1 hour or 2 hours.
   2. T-Rating: 1 hour or 2 hours.
   3. W-Rating: No leakage of water at completion of water leakage testing.
   4. Type of Fill Materials: As required to achieve rating.

D. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing:
   1. F-Rating: 1 hour or 2 hours.
   2. T-Rating: 1 hour or 2 hours.
   3. W-Rating: No leakage of water at completion of water leakage testing.
   4. Type of Fill Materials: As required to achieve rating.

END OF SECTION 078413

# SECTION 260010 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Supplemental requirements generally applicable to the Work specified in Division 26. This Section is also referenced by related Work specified in other Divisions.

### 1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:

1. A: Ampere, unit of electrical current.
2. AC or ac: Alternating current.
3. AFCI: Arc-fault circuit interrupter.
4. AIC: Ampere interrupting capacity.
5. AL, Al, or ALUM: Aluminum.
6. ASD: Adjustable-speed drive.
7. ATS: Automatic transfer switch.
8. AWG: American wire gauge; see ASTM B258.
9. BAS: Building automation system.
10. BIL: Basic impulse insulation level.
11. BIM: Building information modeling.
12. CAD: Computer-aided design or drafting.
13. CATV: Community antenna television.
14. CB: Circuit breaker.
15. cd: Candela, the SI fundamental unit of luminous intensity.
16. CO/ALR: Copper-aluminum, revised.
17. CU or Cu: Copper.
18. CU-AL or AL-CU: Copper-aluminum.
19. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
20. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
21. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
22. dBm: Decibel absolute power with respect to 1 mW.
23. DC or dc: Direct current.
24. DCOA: Designated critical operations area.
25. DDC: Direct digital control (HVAC).
26. EGC: Equipment grounding conductor.
27. EMF: Electromotive force.
28. EMI: Electromagnetic interference.

29. EPM: Electrical preventive maintenance.
30. EPS: Emergency power supply.
31. EPSS: Emergency power supply system.
32. ESS: Energy storage system.
33. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion 1 fc = 10 lx in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
34. FLC: Full-load current.
35. ft: Foot.
36. ft-cd: Foot-candle, the antiquated U.S. Standard unit of illuminance, equal to one international candle measured at a distance of one foot, that was superseded in 1948 by the unit "footcandle" after the SI unit candela (cd) replaced the international candle; see "fc,"
37. GEC: Grounding electrode conductor.
38. GFCI: Ground-fault circuit interrupter.
39. GFPE: Ground-fault protection of equipment.
40. GND: Ground.
41. HACR: Heating, air conditioning, and refrigeration.
42. HDPE: High-density polyethylene.
43. HP or hp: Horsepower.
44. HVAC: Heating, ventilating, and air conditioning.
45. Hz: Hertz.
46. IBT: Intersystem bonding termination.
47. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
48. IP: Ingress protection rating (enclosures); Internet protocol (communications).
49. IR: Infrared.
50. IS: Intrinsically safe.
51. IT&R: Inspecting, testing, and repair.
52. ITE: Information technology equipment.
53. kAIC: Kiloampere interrupting capacity.
54. kcmil or MCM: One thousand circular mils.
55. kV: Kilovolt.
56. kVA: Kilovolt-ampere.
57. kVAr or kVAR: Kilovolt-ampere reactive.
58. kW: Kilowatt.
59. kWh: Kilowatt-hour.
60. lb: Pound (weight).
61. lbf: Pound (force).
62. LCD: Liquid-crystal display.
63. LCDI: Leakage-current detector-interrupter.
64. LED: Light-emitting diode.
65. Li-ion: Lithium-ion.
66. lm: Lumen, the SI derived unit of luminous flux.
67. LRC: Locked-rotor current.
68. LV: Low voltage.
69. lx: Lux, the SI derived unit of illuminance equal to one lumen per square meter.
70. m: Meter.
71. MLO: Main lugs only.

72. MV: Medium voltage.
73. MVA: Megavolt-ampere.
74. mW: Milliwatt.
75. MW: Megawatt.
76. MWh: Megawatt-hour.
77. NC: Normally closed.
78. Ni-Cd: Nickel-cadmium.
79. NO: Normally open.
80. NPT: National (American) standard pipe taper.
81. OCPD: Overcurrent protective device.
82. ONT: Optical network terminal.
83. PC: Personal computer.
84. PCS: Power conversion system.
85. PCU: Power-conditioning unit.
86. PF or pf: Power factor.
87. PHEV: Plug-in hybrid electric vehicle.
88. PLC: Programmable logic controller.
89. PLFA: Power-limited fire alarm.
90. PoE: Power over Ethernet.
91. PV: Photovoltaic.
92. PVC: Polyvinyl chloride.
93. RMS or rms: Root-mean-square.
94. RPM or rpm: Revolutions per minute.
95. SCADA: Supervisory control and data acquisition.
96. SCR: Silicon-controlled rectifier.
97. SPD: Surge protective device.
98. sq.: Square.
99. SWD: Switching duty.
100. TCP/IP: Transmission control protocol/Internet protocol.
101. TEFC: Totally enclosed fan-cooled.
102. TR: Tamper resistant.
103. TVSS: Transient voltage surge suppressor.
104. UL: (standards) Underwriters Laboratories, Inc.; (product categories) UL, LLC.
105. UL CCN: UL Category Control Number.
106. UPS: Uninterruptible power supply.
107. USB: Universal serial bus.
108. UV: Ultraviolet.
109. V: Volt, unit of electromotive force.
110. V(ac): Volt, alternating current.
111. V(dc): Volt, direct current.
112. VA: Volt-ampere, unit of complex electrical power.
113. VAR: Volt-ampere reactive, unit of reactive electrical power.
114. VFC: Variable-frequency controller.
115. VOM: Volt-ohm-multimeter.
116. VPN: Virtual private network.
117. VRLA: Valve regulated lead acid; also called "sealed lead acid (SLA)" or "valve regulated sealed lead acid."
118. W: Watt, unit of real electrical power.
119. Wh: Watt-hour, unit of electrical energy usage.

120. WPT: Wireless power transfer.
121. WPTE: Wireless power transfer equipment.
122. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:

1. EMT: Electrical metallic tubing.
2. ENT: Electrical nonmetallic tubing.
3. EPEC: Electrical HDPE underground conduit.
4. EPEC-40: Schedule 40 electrical HDPE underground conduit.
5. EPEC-80: Schedule 80 electrical HDPE underground conduit.
6. EPEC-A: Type A electrical HDPE underground conduit.
7. EPEC-B: Type B electrical HDPE underground conduit.
8. ERMC: Electrical rigid metal conduit.
9. ERMC-S: Steel electrical rigid metal conduit.
10. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
11. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
12. ERMC-SS: Stainless steel electrical rigid metal conduit.
13. FMC: Flexible metal conduit.
14. FMT: Steel flexible metallic tubing.
15. FNMC: Flexible nonmetallic conduit. See "LFNC."
16. HDPE: See EPEC.
17. LFMC: Liquidtight flexible metal conduit.
18. LFNC: Liquidtight flexible nonmetallic conduit.
19. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.
20. PVC: Rigid PVC conduit.
21. PVC-40: Schedule 40 rigid PVC conduit.
22. PVC-80: Schedule 80 rigid PVC Conduit.
23. PVC-A: Type A rigid PVC concrete-encased conduit.
24. PVC-EB: Type EB rigid PVC concrete-encased underground conduit.
25. RGS: See ERMC-S-G.
26. RMC: See ERMC.
27. RTRC: Reinforced thermosetting resin conduit.

C. Definitions:

1. Basic Impulse Insulation Level (BIL): Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.
2. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
3. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.

4. Designated Seismic System: A system component that requires design in accordance with Ch. 13 of ASCE/SEI 7 and for which the Component Importance Factor is greater than 1.0.
5. Direct Buried: Installed underground without encasement in concrete or other protective material.
6. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:

    a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
    b. Concrete Box: A box intended for use in poured concrete.
    c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
    d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
    e. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
    f. Device Box: A box with provisions for mounting a wiring device directly to the box.
    g. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
    h. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
    i. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
    j. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
    k. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
    l. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
    m. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
    n. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
7. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.

    a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2

electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.

8. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.
9. Jacket: A continuous nonmetallic outer covering for conductors or cables.
10. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
11. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
12. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
13. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
14. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
15. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
16. Sheath: A continuous metallic covering for conductors or cables.
17. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
18. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:

    a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
    b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
    c. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
    d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
    e. Medium Voltage (MV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
    f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.

19. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.

## 1.3 COORDINATION

A. Permitting: Arlington County WPCB shall be responsible for obtaining electrical permits and other associated building permits required to perform work.

B. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:

1. Notify Owner no fewer than fourteen days days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.
3. Notify Fire Department representative and fire control system contractor in advance of proposed interruption of electrical service.
4. Notify Network and Laboratory Systems in advance of proposed interruption of electrical service to building and specific areas.
5. Coordinate interruption with systems impacted by outage including, but not limited to, the following:

    a. Exercising generators.
    b. Emergency lighting.
    c. Elevators.
    d. Fire-alarm systems.

C. Arrange to provide temporary electrical powerin accordance with requirements specified in Division 01.

## 1.4 PREINSTALLATION MEETINGS

A. Electrical Preconstruction Conference: Schedule conference with Architect and Owner, not later than 10 days after notice to proceed. Agenda topics include, but are not limited to, the following:

1. Electrical installation schedule.
2. Status of power system studies.
3. Value analysis proposals and requests for substitution of electrical equipment.
4. Commissioning activities.

1.5 SEQUENCING

A. Conduct and submit results of power system studies before submitting Product Data and Shop Drawings for electrical equipment.

1.6 INFORMATIONAL SUBMITTALS

A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner including, but not limited to, milestone dates for the following activities:

1. Submission of power system studies.
2. Submission of specified coordination drawings.
3. Submission of action submittals specified in Division 26.
4. Orders placed for major electrical equipment.
5. Arrival of major electrical equipment on-site.
6. Preinstallation meetings specified in Division 26.
7. Utility service outages.
8. Closing of walls and ceilings containing electrical Work.
9. System startup, testing, and commissioning activities for major electrical equipment.
10. Requests for special inspections.
11. Requests for inspections by authorities having jurisdiction.

B. Delegated Design Drawings for Structural Masonry Wall Penetrations: Where indicated on Drawings, provide reflected ceiling plan(s), supplemented by elevations, sections, and other details, drawn to scale, signed and sealed by a qualified structural professional engineer, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Location and dimensions of structural members supporting wall.
2. Location and dimensions of columns near penetrations.
3. Location and dimension of headers and lintels.
4. Doors and windows near penetrations.
5. Location and dimensions of penetrating cuts.
6. Sprinkler piping and sleeves.
7. Plumbing piping and sleeves.
8. Ductwork and sleeves.
9. Cable tray and sleeves.
10. Conduit and sleeves.
11. Firestopping assemblies for rated penetrations.
12. Structural supports for piping, ductwork, and conduit on both sides of wall.

C. Certificates:

1. Welding certificates.
2. Seismic-Load Performance Certificates: Provide special certification for designated seismic systems as indicated in Paragraph 13.2.2 "Special Certification Requirements for Designated Seismic Systems" of ASCE/SEI 7-05 for all designated seismic-load systems identified on Drawings or in the Specifications.

a. Include the following information:

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.
4) Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
5) Provide equipment manufacturer's written certification for each designated active electrical seismic device and system, stating that it will remain operable following the design earthquake. Certification must be based on requirements of ASCE/SEI 7, including shake table testing per ICC-ES AC156 or a similar nationally recognized testing standard procedure acceptable to authorities having jurisdiction, or experience data as permitted by ASCE/SEI 7-05.
6) Provide equipment manufacturer's written certification that components with hazardous contents maintain containment following the design earthquake by methods required in ASCE/SEI 7-05.
7) Submit evidence demonstrating compliance with these requirements for approval to authorities having jurisdiction after review and acceptance by qualified structural professional engineer.

D. Qualification Statements:

1. For low-voltage electrical testing agency and on-site electrical testing supervisor.

## 1.7 CLOSEOUT SUBMITTALS

A. Updated Facility EPM Program Binders:

1. Complete Set: On approved online or cloud solution and USB media that is clearly and permanently labeled with attached placard on lanyard to prevent misplacement.
2. Volumes 2 and 8: Reproducible hardcopy on archival quality, 28 lb, acid-free, bond paper.

B. Operation and Maintenance Data:

1. Provide emergency operation, normal operation, and preventive maintenance manuals for each system, equipment, and device listed below:

a. Panelboards and low voltage transformers.

2. Include the following information:

a. Manufacturer's operating specifications.
b. User's guides for software and hardware.
c. Schedule of maintenance material items recommended to be stored at Project site.

d. Detailed instructions covering operation under both normal and abnormal conditions.
e. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
f. List of load-current and overload-relay heaters with related motor nameplate data.
g. List of lamp types and photoelectric relays used on Project, with ANSI and manufacturers' codes.
h. Manufacturer's instructions for setting field-adjustable components.
i. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.
j. EPSS: Manufacturer's system checklists, maintenance schedule, and maintenance log sheets in accordance with NFPA 110.
k. Exterior pole inspection and repair procedures.

C. Software and Firmware Operational Documentation: Provide software and firmware operational documentation, including the following:

1. Software operating and upgrade manuals.
2. Names, versions, and website addresses for locations of installed software.
3. Device address list.
4. Printout of software application and graphic screens.

D. Software:

1. Program Software Backup: Provide username and password for approved online or cloud solution and USB media that is clearly and permanently labeled with attached placard on lanyard to prevent misplacement.
2. Provide to Owner upgrades and unrestricted licenses for installed and backup software, including operating systems and programming tools required for operation and maintenance.

## 1.8 QUALIFICATIONS

A. Qualified Regional Manufacturer: Manufacturer, possessing qualifications specified in Section 014000 "Quality Requirements," that maintains a service center capable of providing training, parts, and emergency on-site repairs to Project site with response time less than eight hours.

## 1.9 FIELD CONDITIONS

A. Service Conditions for Electrical Power Equipment: Specified electrical power equipment must be suitable for operation under service conditions specified as usual service conditions in applicable NEMA PB series, IEEE C37 series, and IEEE C57 series standards.

PART 2 - PRODUCTS

2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

A. Substitution requests for electrical equipment will be entertained under the following conditions:

1. Substitution requests may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with Project performance requirements while significantly increasing value for Owner throughout life of facility.
2. Substitution requests may be submitted for consideration concurrently with submission of power system study reports when those reports indicate that substitution is necessary for safety of maintenance personnel and facility occupants.
3. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. After the Electrical Preconstruction Conference, insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

2.2 FACILITY ELECTRICAL PREVENTIVE MAINTENANCE (EPM) PROGRAM BINDERS

A. Description: Set of binders containing operation and maintenance data for facility's electrical equipment that was compiled during analysis of installed electrical Work for Facility EPM Program development.

B. Applicable Standards:

1. Regulatory Requirements: Comply with recommendations in NFPA 70B.
2. General Characteristics:

a. Volume 1 - Introduction:

1) Summarize how Facility EPM Program Analysis was performed, how data were collected, and how volumes are organized.
2) Describe Facility EPM Program and provide recommended policies and procedures for implementing the program and keeping it current.
3) Provide place for Owner to identify contact information for employees responsible for implementing and maintaining Facility EPM Program.

b. Volume 2 - Facility Safety, Hazards Awareness, and Emergency Procedures:

1) Include training requirements for employees and contractors.
2) Include list of known facility hazards impacting IT&R activities.
3) Include approval and permitting procedures for IT&R activities.
4) Include incident emergency response procedures.
5) Include emergency shutdown procedures.
6) Include electrical disaster recovery procedures.

c. Volume 4 - Facility Diagrams and Schedules:

1) Include single-line diagrams.
2) Include grounding and bonding diagrams.
3) Include essential wiring diagrams.
4) Include system automation diagrams (SCADA, BMS, lighting, HVAC, etc.).
5) Include records of switchgear, switchboard, and panelboard schedules.
6) Include time-current curves for overcurrent protective devices.
7) Include list of load-current and overload-relay heaters with related motor nameplate data.

d. Volume 5 - Inventory of Facility Equipment Using Electrical Power:

1) Include simplified floor plans showing equipment locations.
2) Identify critical equipment (electrical or otherwise).
3) Include identifying designations and nameplate data.
4) Include warranty and maintenance contract information.

e. Volume 6 - Inventory of Facility Tools, Supplies, and Personnel Protective Equipment:

1) Include schedules of maintenance material items recommended to be stored at facility.
2) Include list of lamp types and photoelectric relays used in facility with ANSI and manufacturers' codes.
3) Include calibration and servicing data for each item.

f. Volume 7 - Inspection, Testing, and Repair (IT&R) Plan:

1) Include tables showing frequency of activities for each item.
2) Include annual schedule with activities mapped to specific days of the year.
3) Include exterior pole inspection and repair procedures.

g. Volume 10 - Spare Parts List:

1) Include list of all parts required to perform IT&R procedures.
2) Identify quantities of which parts are recommended to be stored on-site.
3) Include source contact information and budget cost for each item.

h. Volume 11 - Construction Project Closeout Record Documentation:

1) Include records of power system studies and photometric studies.
2) Include records of risk assessment studies.
3) Include records of electrical system startup and commissioning activities.
4) Include records of baseline inspections and tests.
5) Include records of baseline infrared photographs with normal light photographs showing the location, direction, angle, and conditions necessary for reproducing each infrared photograph.
6) Include records of baseline settings for adjustable equipment and devices.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL WORK

A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of Work specified in Division 26. Consult Architect for resolution of conflicting requirements.

3.2 FIELD QUALITY CONTROL

A. Administrant for Low-Voltage Electrical Tests and Inspections:

1. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.

END OF SECTION 260010

# SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Copper building wire.
2. Connectors and splices.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

### 1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

## 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. General Cable; Prysmian Group North America.
2. Southwire Company, LLC.
3. WESCO.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.

## 2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M Electrical Products.
2. Hubbell Utility Solutions; Hubbell Incorporated.
3. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton 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:

1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
2. Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors must be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:

1. Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
2. Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION, GENERAL

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."

G. Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch 1of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Electrical contractor shall be permitted to perform required testing. Owner and/or Engineer shall be permitted to witness testing.

2. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

3. 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.

4. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

   a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   b. 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.

5. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

B. Cables will be considered defective if they do not pass tests and inspections. Defective cables shall be replaced in their entirety and shall be required to be retested until all tests and inspections have been passed.

C. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

# SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Support, anchorage, and attachment components.
2. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

### 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.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified structural professional engineer to design hanger and support system.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit; Atkore International.
b. G-Strut.
c. Unistrut; Atkore International.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: Galvanized steel.
4. Channel Width: Selected for applicable load 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. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. 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 must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

E. 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.

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) Hilti, Inc.
      2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      3) 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.
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.

# PART 3 - EXECUTION

## 3.1 SELECTION

A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:

   1. NECA NEIS 101
   2. NECA NEIS 102.
   3. NECA NEIS 105.
   4. NECA NEIS 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 "Raceway and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as required by NFPA 70. Minimum rod size must be 1/4 inch 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 and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

## 3.2 INSTALLATION OF SUPPORTS

A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA NEIS 1, EMT and ERMC may be supported by openings through structure members, in accordance with 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 must be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To 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 inch thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inch thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69, spring-tension clamps.
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. Submit welding certificates.

## 3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inch 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, 28-day compressive-strength 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:

1. 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.

    a. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 260529

# SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Type EMT raceways and elbows.
2. Type ENT raceways and fittings.
3. Type ERMC raceways, elbows, couplings, and nipples.
4. Type FMC raceways.
5. Type LFMC raceways.
6. Fittings for conduit, tubing, and cable.
7. Threaded metal joint compound.
8. Solvent cements.
9. Strut-type channel raceways and fittings.
10. Wireways and auxiliary gutters.
11. Metallic outlet boxes, device boxes, rings, and covers.
12. Termination boxes.
13. Cabinets, cutout boxes, junction boxes, pull boxes, and miscellaneous enclosures.
14. Cover plates for device boxes.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

### 1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Wireways and auxiliary gutters.
2. Cabinets, cutout boxes, and miscellaneous enclosures.

### 1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Instructions:

1. For Type ERMC.

PART 2 - PRODUCTS

2.1 TYPE EMT RACEWAYS AND ELBOWS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 797A and UL Category Control Number FJMX.

2.2 TYPE EMT RACEWAYS AND ELBOWS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 797 and UL Category Control Number FJMX.

B. Steel Electrical Metal Tubing (EMT) and Elbows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Allied Tube & Conduit; Atkore International.
   b. Emerson Electric Co.
   c. Wheatland Tube; Zekelman Industries.

2. Material: Steel.
3. Options:

   a. Exterior Coating: Zinc.
   b. Interior Coating: Zinc with organic top coating.
   c. Minimum Trade Size: Metric designator 21 (trade size 3/4).
   d. Colors: As indicated on Drawings.

2.3 TYPE ENT RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 1653 and UL Category Control Number FKHU.

B. Electrical Nonmetallic Tubing (ENT) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABB, Electrification Business.
b. Cantex Inc.
c. JM Eagle; J-M Manufacturing Co., Inc.

2. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Fittings:

1) Mechanically Attached Fittings: UL 1653.
2) Solvent-Attached Fittings: UL 651.

## 2.4 TYPE ERMC RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 6 and UL Category Control Number DYIX.

B. Galvanized-Steel Electrical Rigid Metal Conduit, Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit; Atkore International.
b. Crouse-Hinds; brand of Eaton, Electrical Sector.
c. Wheatland Tube; Zekelman Industries.

2. Exterior Coating: Zinc.
3. Options:

a. Interior Coating: Zinc with organic top coating.
b. Minimum Trade Size: Metric designator 21 (trade size 3/4).
c. Colors: As indicated on Drawings.

## 2.5 TYPE FMC RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 1 and UL Category Control Number DXUZ.

B. Steel Flexible Metal Conduit (FMC):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABB, Electrification Business.
b. Electri-Flex Company.
c. Penn Aluminum Conduit & EMT.

2. Material: Steel.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Colors: As indicated on Drawings.

## 2.6 TYPE LFMC RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 360 and UL Category Control Number DXHR.

B. Steel Liquidtight Flexible Metal Conduit (LFMC):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABB, Electrification Business.
b. Anaconda Sealtite; Anamet Electrical, Inc.
c. Electri-Flex Company.

2. Material: Steel.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Colors: As indicated on Drawings.

## 2.7 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

B. Fittings for Type ERMC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crouse-Hinds; brand of Eaton, Electrical Sector.
b. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
c. Southwire Company, LLC.

2. General Characteristics: UL 514B and UL Category Control Number DWTT.
3. Options:

   a. Material: Steel.
   b. Coupling Method: Compression coupling.
   c. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
   d. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

C. Fittings for Type EMT Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit; Atkore International.
   b. Crouse-Hinds; brand of Eaton, Electrical Sector.
   c. Southwire Company, LLC.

2. General Characteristics: UL 514B and UL Category Control Number FKAV.
3. Options:

   a. Material: Steel.
   b. Coupling Method: Compression coupling.
   c. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
   d. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

D. Fittings for Type LFMC and Type LFNC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Liquid Tight Connector Co.

2. General Characteristics: UL 514B and UL Category Control Number DXAS.

## 2.8 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 2419 and UL Category Control Number FOIZ.

B. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. ABB, Electrification Business.

## 2.9 SOLVENT CEMENTS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL Category Control Number DWTT.

## 2.10 STRUT-TYPE CHANNEL RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 5B and UL Category Control Number RIUU.

B. Strut-Type Channel Raceways and Fittings with Metallic Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ABB, Electrification Business.
   b. Cooper B-line; brand of Eaton, Electrical Sector.
   c. Power-Strut; Atkore International.
   d. Unistrut; Atkore International.

2. Options:

   a. Manufacturer's standard enamel finish in color selected by Architect.

## 2.11 WIREWAYS AND AUXILIARY GUTTERS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 870 and UL Category Control Number ZOYX.

B. Metal Wireways and Auxiliary Gutters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Square D; Schneider Electric USA
   b. Cooper B-line; brand of Eaton, Electrical Sector.
   c. Hoffman; brand of nVent Electrical plc

2. Additional Characteristics:

a. 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.
b. Finish: Manufacturer's standard enamel finish.

3. Options:

a. Degree of Protection: Type 1 unless otherwise indicated.
b. Wireway Covers: Hinged type unless otherwise indicated.

## 2.12 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 514A and UL Category Control Number QCIT.

B. Metallic Outlet Boxes:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
b. Pass & Seymour; Legrand North America, LLC.
c. Wiremold; Legrand North America, LLC.

3. Options:

a. Material: Sheet steel.
b. Sheet Metal Depth: Minimum 1.5 inch.
c. Cast-Metal Depth: Minimum 1.8 inch.

C. Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crouse-Hinds; brand of Eaton, Electrical Sector.

b. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
c. Pass & Seymour; Legrand North America, LLC.

D. Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crouse-Hinds; brand of Eaton, Electrical Sector.
b. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.

3. Options:

a. Material: Sheet steel.
b. Sheet Metal Depth: minimum 1.5 inch.
c. Cast-Metal Depth: minimum 1.8 inch.

E. Metallic Extension Rings:

1. Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper B-line; brand of Eaton, Electrical Sector.
b. Crouse-Hinds; brand of Eaton, Electrical Sector.
c. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.

## 2.13 TERMINATION BOXES

A. Description: Enclosure for termination base consisting of lengths of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors or both.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 1773 and UL Category Control Number XCKT.

2.14 CABINETS, CUTOUT BOXES, JUNCTION BOXES, PULL BOXES, AND MISCELLANEOUS ENCLOSURES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics:

a. Non-Environmental Characteristics: UL 50.
b. Environmental Characteristics: UL 50E.

B. Indoor Sheet Metal Cabinets:

1. Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper B-line; brand of Eaton, Electrical Sector.
b. Erickson Electrical Equipment Company.
c. Hoffman; brand of nVent Electrical plc.

3. Additional Characteristics: UL Category Control Number CYIV.
4. Options:

a. Degree of Protection: Type 1.

C. Indoor Sheet Metal Cutout Boxes:

1. Description: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper B-line; brand of Eaton, Electrical Sector.
b. Erickson Electrical Equipment Company.
c. Hoffman; brand of nVent Electrical plc.

3. Additional Characteristics: UL Category Control Number CYIV.

D. Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper B-line; brand of Eaton, Electrical Sector.
b. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.
c. Hoffman; brand of nVent Electrical plc.

3. Additional Characteristics: UL Category Control Number BGUZ.
4. Options:

a. Degree of Protection: Type 1.

E. Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crouse-Hinds; brand of Eaton, Electrical Sector.
b. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.
c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.

3. Additional Characteristics: UL Category Control Number BGUZ.
4. Options:

a. Degree of Protection: Type 1.

## 2.15 COVER PLATES FOR DEVICES BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics:

a. Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
b. Wallplate-Securing Screws: Metal with head color to match wallplate finish.

B. Metallic Cover Plates for Device Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
b. Leviton Manufacturing Co., Inc.
c. Pass & Seymour; Legrand North America, LLC.

2. Options:

   a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
   b. Wallplate Material: 0.032 inch thick Type 302/304 non-magnetic stainless steel with brushed finish.

PART 3 - EXECUTION

3.1 SELECTION OF RACEWAYS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult Owner and/or Engineer for resolution of conflicting requirements.

B. Indoors:

   1. Hazardous Classified Locations: ERMC.

   2. Exposed and Subject to Severe Physical Damage: ERMC. Subject to severe physical damage includes the following locations:

      a. Loading docks.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      c. Mechanical rooms.

   3. Exposed and Subject to Physical Damage: ERMC. Subject to physical damage includes the following locations:

      a. Locations less than 2.5 m (8 ft) above finished floor.
      b. Stub-ups to above suspended ceilings.

   4. Exposed and Not Subject to Physical Damage: ERMC.
   5. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   6. Damp or Wet Locations: ERMC.
   7. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

C. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

   1. ERMC: Provide threaded type fittings unless otherwise indicated.

   2. Hazardous Locations: Provide threaded couplings or explosionproof fittings between the sealing fitting and the explosionproof enclosure.

## 3.2 SELECTION OF BOXES AND ENCLOSURES

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.

B. Degree of Protection:

1. Indoors:

a. Type 1 unless otherwise indicated.

C. Exposed Boxes Installed Less Than 2.5 m (8 ft) Above Floor:

1. Provide cast-metal boxes.
2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

## 3.3 INSTALLATION OF RACEWAYS

A. Installation Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult Architect for resolution of conflicting requirements.
2. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
3. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
4. Comply with NECA NEIS 101 for installation of steel raceways.
5. Comply with NECA NEIS 102 for installation of aluminum raceways.
6. Comply with NECA NEIS 111 for installation of nonmetallic raceways.
7. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
8. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts.
9. Raceway Terminations at Locations Subject to Moisture or Vibration:

a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

B. General Requirements for Installation of Raceways:

1. Complete raceway installation before starting conductor installation.

2. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.
3. Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inch of changes in direction.
4. Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
5. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
6. Support conduit within 12 inch of enclosures to which attached.
7. Install raceway sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings in accordance with NFPA 70.
8. 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 interior of raceways at the following points:

    a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
    b. Where an underground service raceway enters a building or structure.
    c. Conduit extending from interior to exterior of building.
    d. Conduit extending into pressurized duct and equipment.
    e. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
    f. Conduit leaving a hazardous location.
    g. Where two or more enclosures that require conduit seals are connected by nipples or conduit no more than 36-inches long, a single conduit seal in each nipple connection or run of conduit shall be considered sufficient if the seal is located not more than 18-inches from either enclosure.
    h. Where connections are made to enclosures that are required to be explosionproof.
    i. Where otherwise required by NFPA 70.

9. Do not install raceways or electrical items on "explosion-relief" walls or rotating equipment.
10. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
11. Keep raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
12. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
13. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

C. Requirements for Installation of Specific Raceway Types:

1. Types ERMC:

a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

D. Stub-ups to Above Recessed Ceilings:

1. Provide EMT or ERMC for raceways.
2. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

E. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
2. EMT: Provide compression, steel fittings. Comply with NEMA FB 2.10.
3. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

F. Raceways Penetrating Rooms or Walls with Acoustical Requirements:

1. Seal raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.

## 3.4 INSTALLATION OF BOXES AND ENCLOSURES

A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.

B. 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 bottom of box unless otherwise indicated.

C. 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, whether installed indoors or outdoors.

D. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

E. Locate boxes so that cover or plate will not span different building finishes.

F. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.

G. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.

H. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.

I. Set metal floor boxes level and flush with finished floor surface.

J. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

K. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.

L. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.

M. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

1. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
2. Provide gaskets for wallplates and covers.

## 3.5 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

## 3.6 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.

## 3.7 CLEANING

A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

END OF SECTION 260533

# SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Round sleeves.
2. Rectangular sleeves.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.
6. Pourable sealants.
7. Foam sealants.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. 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 ROUND SLEEVES

A. Steel Wall Sleeves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, LLC.
b. CCI Piping Systems.
c. Flexicraft Industries.
d. GPT; an EnPro Industries company.

2. General Characteristics: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

B. Cast-Iron Wall Sleeves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Ductile Iron Pipe.
   b. Flexicraft Industries.
   c. McWane Ductile.

2. General Characteristics: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.

C. PVC Pipe Sleeves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. CCI Piping Systems.
   b. GPT; an EnPro Industries company.
   c. Metraflex Company (The).

2. General Characteristics: ASTM D1785, Schedule 40.

D. PVC Molded Sleeves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ABB, Electrification Business.
   b. Arlington Industries, Inc.
   c. Reliance Worldwide Corporation.

2. General Characteristics: With nailing flange for attaching to wooden forms.

E. PE or PP Molded Sleeves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Crete-Sleeve.

2. General Characteristics: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Round, Galvanized-Steel, Sheet Metal Sleeves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Benefast.
   b. Specified Technologies, Inc.

2. General Characteristics: Galvanized-steel sheet; thickness not less than 0.0239 inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

## 2.2 RECTANGULAR SLEEVES

A. Rectangular, Galvanized-Steel, Sheet Metal Sleeves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Abesco Fire LLC.
   b. Specified Technologies, Inc.
   c. Wiremold; Legrand North America, LLC.

2. General Characteristics:

   a. Material: Galvanized sheet steel.
   b. Minimum Metal Thickness:

      1) For sleeve cross-section rectangle perimeter less than 50 inch and with no side larger than 16 inch, thickness must be 0.052 inch.
      2) For sleeve cross-section rectangle perimeter not less than 50 inch or with one or more sides larger than 16 inch, thickness must be 0.138 inch.

## 2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, LLC.
2. Flexicraft Industries.
3. Metraflex Company (The).

B. General Characteristics: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.

C. Options:

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

## 2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. HoldRite; Reliance Worldwide Company.

B. General Characteristics: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit must have plastic or rubber waterstop collar with center opening to match piping OD.

## 2.5 GROUT

A. General Characteristics: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000 psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

## 2.6 POURABLE SEALANTS

A. Performance Criteria:

1. General Characteristics: Single-component, neutral-curing elastomeric sealants of grade indicated below.

a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

## 2.7 FOAM SEALANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dow Chemical Company (The).
2. Innovative Chemical Products (Building Solutions Group).

B. Performance Criteria:

1. General Characteristics: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. 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 space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
b. 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."

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4 inch annular clear space between sleeve and raceway or cable, unless sleeve-seal system 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 inch above finished floor level. Install sleeves during erection of floors.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve-seal systems. Size sleeves to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.

B. Install conduits and cable with no crossings within the sleeve.

C. Fill opening around conduits and cables with expanding foam without leaving voids.

D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

## 3.3 INSTALLATION OF SLEEVE-SEAL SYSTEMS

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.

END OF SECTION 260544

# SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Bands and tubes.
3. Tapes and stencils.
4. Tags.
5. Signs.
6. Cable ties.
7. Miscellaneous identification products.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

### 1.2 ACTION SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with 29 CFR 1910.144 for color identification of hazards; 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs and tags; and the following:

1. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.

C. Signs, labels, and tags required for personnel safety must comply with the following standards:

1. Safety Colors: NEMA Z535.1.
2. Facility Safety Signs: NEMA Z535.2.

3. Safety Symbols: NEMA Z535.3.
4. Product Safety Signs and Labels: NEMA Z535.4.
5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.

D. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, must comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 1000 V or Less:

1. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.

1. Color must be factory applied.
2. Colors for 208Y/120 V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.

3. Colors for 480Y/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.

C. Warning Label Colors:

1. Identify system voltage with black letters on orange background.

D. Warning labels and signs must 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 3 FEET MINIMUM."

E. Equipment Identification Labels:

1. Black letters on white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. emedco.
c. Panduit Corp.

B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Marking Services, Inc.
c. Panduit Corp.

C. Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. emedco.
c. Panduit Corp.

2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over legend. Labels sized such that clear shield overlaps entire printed legend.
3. Marker for Labels:

a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
b. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. emedco.
c. Panduit Corp.

2. Minimum Nominal Size:

a. 1-1/2 by 6 inch for raceway and conductors.
b. 3-1/2 by 5 inch for equipment.

## 2.4 BANDS AND TUBES

A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inch long, with diameters sized to suit diameters and that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. HellermannTyton.
c. Panduit Corp.

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 maximum of 200 deg F. Comply with UL 224.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Panduit Corp.

## 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.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carlton Industries, LP.
b. HellermannTyton.
c. Panduit Corp.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil thick by 1 to 2 inch wide; compounded for outdoor use.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Carlton Industries, LP.
c. emedco.

C. Tape and Stencil: 4 inch wide black stripes on 10 inch centers placed diagonally over orange background and are 12 inch wide. Stop stripes at legends.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. HellermannTyton.
b. LEM Products Inc.
c. Seton Identification Products; a Brady Corporation company.

D. Floor Marking Tape: 2 inch wide, 5 mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carlton Industries, LP.
b. Seton Identification Products; a Brady Corporation company.

E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height must be 1 inch.

## 2.6 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. emedco.
c. Seton Identification Products; a Brady Corporation company.

## 2.7 SIGNS

A. Metal-Backed Butyrate Signs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Brady Corporation.
    b. Champion America.
    c. emedco.

2. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396 inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
3. 1/4 inch grommets in corners for mounting.
4. Nominal Size: 10 by 14 inch.

B. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Brady Corporation.
    b. Carlton Industries, LP.
    c. emedco.

2. Engraved legend.
3. Thickness:

    a. For signs up to 20 sq. inch, minimum 1/16 inch thick.
    b. For signs larger than 20 sq. inch, 1/8 inch thick.
    c. Engraved legend with black letters on white face.
    d. Punched or drilled for mechanical fasteners with 1/4 inch grommets in corners for mounting.
    e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## 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 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 1000 V: Identification must 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 1000 V: Identification must 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. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.

K. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:

1. "UPS."

L. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.

M. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.

N. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.

O. Self-Adhesive Labels:

1. Install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.

2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high label; where two lines of text are required, use labels 2 inch high.

P. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.

Q. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.

R. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.

S. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

T. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

U. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's instructions.

V. Metal Tags:

1. Place in location with high visibility and accessibility.
2. Secure using plenum-rated cable ties.

W. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high sign; where two lines of text are required, use labels 2 inch high.

X. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high sign; where two lines of text are required, use labels 2 inch high.

## 3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 1000 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.

D. Accessible Fittings for Raceways and Cables within Buildings: Identify cover of junction and pull box of the following systems with self-adhesive labels containing wiring system legend and system voltage. System legends must be as follows:

1. "UPS."

E. Power-Circuit Conductor Identification, 1000 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels, self-adhesive wraparound labels, snap-around labels, snap-around color-coding bands, and self-adhesive vinyl tape to identify phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.

F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, use self-adhesive labels with conductor or cable designation, origin, and destination.

G. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in direction of access to live parts. Workspace must comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

H. Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels and Metal-backed, butyrate warning signs.

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. Controls with external control power connections.

J. Arc Flash Warning Labeling: Self-adhesive labels.

K. Operating Instruction Signs: Self-adhesive labels.

L. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in location provided by panelboard manufacturer. Panelboard identification must be in form of self-adhesive, engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Transformers: Label that includes tag designation indicated on Drawings for transformer, feeder, and panelboards or equipment supplied by secondary.
    e. Substations.
    f. Enclosed switches.
    g. Enclosed circuit breakers.
    h. Enclosed controllers.
    i. Contactors.

END OF SECTION 260553

# SECTION 260573.13 - SHORT-CIRCUIT STUDIES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Computer-based, fault-current study to determine minimum interrupting capacity of circuit protective devices.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260573.16 "Coordination Studies" for overcurrent protective device coordination studies.
3. Section 260573.19 "Arc-Flash Hazard Analysis" for arc-flash studies.

### 1.2 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled. Existing to remain items must remain functional throughout construction period.

B. 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.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

F. Single-Line Diagram: See "One-Line Diagram."

### 1.3 ACTION SUBMITTALS

A. Product Data:

1. For power system analysis software to be used for studies.

B. Short-Circuit Study Report:

1. Submit the following after approval of system protective devices submittals. Submittals must be in digital form.

   a. Short-circuit study input data, including completed computer program input data sheets.
   b. 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.
   c. Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

## 1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

## 1.5 QUALITY ASSURANCE

A. Study must be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms must comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

# PART 2 - PRODUCTS

## 2.1 POWER SYSTEM ANALYSIS SOFTWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ETAP - Digital Twin Platform.
2. SKM Systems Analysis, Inc.

B. Comply with IEEE 399 and IEEE 551.

C. Analytical features of power systems analysis software program must have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program must be capable of plotting and diagramming time-current-characteristic curves as part of its output.

E. Computer program must be designed to perform short-circuit studies or have function, component, or add-on module designed to perform short-circuit studies.

F. Computer program must be developed under supervision of licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

## 2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

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 of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kVA and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
6. Derating factors and environmental conditions.
7. Any revisions to electrical equipment required by study.

D. Comments and recommendations for system improvements or revisions in written document, separate from one-line diagram.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600 V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data:

1. One-line diagram of system being studied.
2. Power sources available.
3. Manufacturer, model, and interrupting rating of protective devices.
4. Conductors.
5. Transformer data.

G. Short-Circuit Study Output Reports:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

   a. Voltage.
   b. Calculated fault-current magnitude and angle.
   c. Fault-point X/R ratio.
   d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

   a. Voltage.
   b. Calculated symmetrical fault-current magnitude and angle.
   c. Fault-point X/R ratio.
   d. Calculated asymmetrical fault currents:

      1) Based on fault-point X/R ratio.
      2) Based on calculated symmetrical value multiplied by 1.6.
      3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

   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 symmetrical basis.
   g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on total basis.

## PART 3 - EXECUTION

### 3.1 POWER SYSTEM DATA

A. Obtain data necessary for conduct of study.

1. Verify completeness of data supplied on one-line diagram. Call discrepancies to Engineer's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
3. For equipment that is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers in accordance with NFPA 70E.

B. Gather and tabulate required input data to support short-circuit study. Comply with requirements in Section 017839 "Project Record Documents" for recording circuit protective device characteristics. Record data on Record Document copy of one-line diagram. Comply with recommendations in IEEE 551 as to amount of detail that is required to be acquired in field. Field data gathering must be by, or under supervision of, qualified electrical professional engineer. Data include, but are not limited to, the following:

1. Product Data for Project's overcurrent protective devices 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 at service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
11. Derating factors.

## 3.2 SHORT-CIRCUIT STUDY

A. Perform study following general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on device characteristics supplied by device manufacturer.

D. Extent of electrical power system to be studied is indicated on Drawings.

E. Begin short-circuit current analysis at service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 5 kA or less.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Include ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for fault-current dc decrement to address asymmetrical requirements of interrupting equipment.

H. Calculate short-circuit momentary and interrupting duties for three-phase bolted fault and single line-to-ground fault at each equipment indicated on one-line diagram.

1. For grounded systems, provide bolted line-to-ground fault-current study for areas as defined for three-phase bolted fault short-circuit study.

I. Include in report identification of protective device applied outside its capacity.

END OF SECTION 260573.13

# SECTION 260573.16 - COORDINATION STUDIES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

   a. Study results must be used to determine coordination of series-rated devices.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260573.13 "Short-Circuit Studies" for fault-current studies.
3. Section 260573.19 "Arc-Flash Hazard Analysis" for arc-flash studies.

### 1.2 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. Existing to remain items must remain functional throughout construction period.

B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when abnormal current flow exists and then removes the affected portion of the circuit from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

F. Single-Line Diagram: See "One-Line Diagram."

### 1.3 ACTION SUBMITTALS

A. Product Data:

1. For power system analysis software to be used for studies.

B. Coordination Study Report:

1. Submit the following after approval of system protective devices submittals. Submittals must be in digital form.

   a. Coordination-study input data, including completed computer program input data sheets.
   b. Study and equipment evaluation reports.
   c. 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.
   d. Revised one-line diagram, reflecting field investigation results and results of coordination study.

## 1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

## 1.5 QUALITY ASSURANCE

A. Studies must be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms must comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

## 1.6 REGULATORY AGENCY APPROVALS

A. Submittals for coordination study requiring approval by authorities having jurisdiction must be signed and sealed by qualified electrical professional engineer responsible for their preparation.

B. Submittals for coordination study require action by Architect prior to submitting for approval by authorities having jurisdiction.

# PART 2 - PRODUCTS

## 2.1 POWER SYSTEM ANALYSIS SOFTWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ETAP - Digital Twin Platform.
2. SKM Systems Analysis, Inc.

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program must have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program must be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program must report device settings and ratings of overcurrent protective devices and must demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

a. Arcing faults.
b. Simultaneous faults.

E. Computer program must be designed to perform coordination studies or have function, component, or add-on module designed to perform coordination studies.

F. Computer program must be developed under supervision of licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

## 2.2 COORDINATION STUDY REPORT CONTENTS

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 of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kVA and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.
6. Revisions to electrical equipment required by study.
7. Study Input Data: As described in "Power System Data" Article.

a. 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."

D. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in field. Use manufacturer's data sheets for recording recommended setting of overcurrent protective devices when available.

    a. Phase and Ground Relays:

        1) Device tag.
        2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
        3) Recommendations on improved relaying systems, if applicable.

    b. Circuit Breakers:

        1) Adjustable pickups and time delays (long time, short time, and ground).
        2) Adjustable time-current characteristic.
        3) Adjustable instantaneous pickup.
        4) Recommendations on improved trip systems, if applicable.

    c. Fuses: Show current rating, voltage, and class.

E. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for switching schemes and for emergency periods where power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying portion of system covered.
2. Terminate device characteristic curves at point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.
3. Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:

    a. Power utility's overcurrent protective device.
    b. Medium-voltage equipment overcurrent relays.
    c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
    d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
    e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
    f. Cables and conductors damage curves.
    g. Ground-fault protective devices.
    h. Motor-starting characteristics and motor damage points.
    i. Generator short-circuit decrement curve and generator damage point.
    j. Largest feeder circuit breaker in each motor-control center and panelboard.

5. Maintain selectivity for tripping currents caused by overloads.
6. Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.

7. Provide adequate time margins between device characteristics such that selective operation is achieved.
8. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance of the Work. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

A. Obtain data necessary for conduct of overcurrent protective device study.

1. Verify completeness of data supplied in one-line diagram on Drawings. Call discrepancies to Architect's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
3. For equipment that is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers must be in accordance with NFPA 70E.

B. Gather and tabulate required input data to support coordination study. List below is guide. Comply with recommendations in IEEE 551 for amount of detail required to be acquired in field. Field data gathering must be by, or under supervision of, qualified electrical professional engineer. 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. Electrical power utility impedance at 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 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. Maximum demands from service meters.
13. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
16. Medium-voltage cable sizes, lengths, conductor material, cable construction, metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).
17. Data sheets to supplement electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Generator thermal-damage curve.
    e. Ratings, types, and settings of utility company's overcurrent protective devices.
    f. Special overcurrent protective device settings or types stipulated by utility company.
    g. Time-current-characteristic curves of devices indicated to be coordinated.
    h. Manufacturer, frame size, interrupting rating in amperes root mean square (rms) symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
    j. Switchgear, switchboards, motor-control centers, and panelboards ampacity, and SCCR in amperes rms symmetrical.
    k. Identify series-rated interrupting devices for condition where available fault current is greater than interrupting rating of downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

## 3.3 COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. Base study on device characteristics supplied by device manufacturer.

D. Extent of electrical power system to be studied is indicated on Drawings.

E. Begin analysis at service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 5 kA or less.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Transformer Primary Overcurrent Protective Devices:

1. Device must not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings must protect transformers according to IEEE C57.12.00, for fault currents.

H. Motor Protection:

1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands maximum short-circuit current for time equivalent to tripping time of primary relay protection or total clearing time of fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

J. Generator Protection: Select protection according to manufacturer's instructions and to IEEE 242.

K. Include ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for fault-current dc decrement, to address asymmetrical requirements of interrupting equipment.

L. Calculate short-circuit momentary and interrupting duties for three-phase bolted fault and single line-to-ground fault at each equipment indicated on one-line diagram.

1. For grounded systems, provide bolted line-to-ground fault-current study for areas as defined for three-phase bolted fault short-circuit study.

M. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Application of series-rated devices must be recertified, complying with requirements in NFPA 70.
4. Include in report identification of protective device applied outside its capacity.

## 3.4 LOAD-FLOW AND VOLTAGE-DROP STUDY

A. Perform load-flow and voltage-drop study to determine steady-state loading profile of system. Analyze power system performance two times as follows:

1. Determine load flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
2. Determine load flow and voltage drop based on 80 percent of design capacity of load buses.
3. Prepare load-flow and voltage-drop analysis and report to show power system components that are overloaded, or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

## 3.5 MOTOR-STARTING STUDY

A. Perform motor-starting study to analyze transient effect of system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze effects of motor starting on power system stability.

B. Prepare motor-starting study report, noting light flicker for limits proposed by IEEE 141 and voltage sags so as not to affect operation of other utilization equipment on system supplying motor.

## 3.6 FIELD ADJUSTING

A. Adjust relay and protective device settings according to recommended settings provided by coordination study. Field adjustments must be completed by engineering service division of equipment manufacturer under "Startup and Acceptance Testing" contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting must be by qualified low-voltage electrical testing and inspecting agency.

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for adjustable overcurrent protective devices.

END OF SECTION 260573.16

SECTION 260573.19

ARC-FLASH HAZARD ANALYSIS

PART 1 - GENERAL

1.1 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.

B. The contractor shall furnish short-circuit and protective device coordination studies.

C. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

1. IEEE 141 - Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
2. IEEE 241 - Recommended Practice for Electric Power Systems in Commercial Buildings
3. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
4. IEEE 399 - Recommended Practice for Industrial and Commercial Power System Analysis
5. IEEE 446 - Emergency and Standby Power Systems
6. IEEE 1015 - Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems
7. IEEE 1584 - Guide for Performing Arc-Flash Hazard Calculations
8. IEEE C37.010 - Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
9. IEEE C37.09 - Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
10. IEEE C37.13 - Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
11. IEEE C37.20.3 - Standard for Metal-Enclosed Interrupter Switchgear
12. IEEE C37.20.4 - Standard for Indoor AC Switches (1 kV to 38 kV) for Use in Metal-Enclosed Switchgear
13. IEEE C 37.41 - Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories

14. IEEE C37.5 - Methods for Determining the RMS Value of a Sinusoidal Current Wave and Normal-Frequency Recovery Voltage, and for Simplified Calculation of Fault Currents
15. IEEE C37.59 - Standard Requirements for Conversion of Power Switchgear Equipment
16. IEEE C57.12.00 -Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
17. IEEE C57.12.01 -Standard for General Requirements for Dry-Type Distribution and Power Transformers

B. The National Fire Protection Association (NFPA)

1. NFPA 70 - National Electrical Code, latest edition
2. NFPA 70E - Standard for Electrical Safety in the Workplace

C. Occupational Safety and Health Administration (OSHA)

1. OSHA 1910.333 - Selection and use of Work Practices

1.3 ACTION SUBMITTALS (FOR REVIEW/APPROVAL PRIOR TO ELECTRICAL EQUIPMENT FABRICATION RELEASE)

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 may 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.

1.4 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.

C. The short-circuit and protective device coordination studies shall be submitted to the Engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the Engineer may be obtained for preliminary submittal of sufficient study data to ensure that the selection of device and characteristics will be satisfactory.

D. Submit to power company for the setting of overcurrent protective devices in main incoming service entrance equipment, including switchgear/switchboard and obtain approval.

## 1.5 SUBMITTALS FOR CONSTRUCTION

A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. No more than five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input and output data. Additional copies, where required, shall be provided on CD in PDF format.

B. The report shall include the following sections:

1. One-line diagram showing protective device ampere ratings and associated designations, cable size & lengths, transformer kVA & voltage ratings, motor & generator kVA ratings, and switchgear/switchboard/panelboard designations
2. Descriptions, purpose, basis and scope of the study
3. Tabulations of the worst-case calculated short circuit duties as a percentage of the applied device rating (circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings
4. Protective device time versus current coordination curves with associated one line diagram identifying the plotted devices, tabulations of ANSI protective relay functions and adjustable circuit breaker trip unit settings
5. Fault study input data, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout
6. Incident energy and flash protection boundary calculations
7. Comments and recommendations for system improvements, including Arc Flash Mitigation for all equipment with incident energy levels above 8 cal/cm$^2$
8. Executive Summary including source of information and assumptions made

## 1.6 CLOSEOUT SUBMITTALS (FOR REVIEW/APPROVAL)

A. Operation and maintenance data.

## 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 with a minimum of five (5) years experience.

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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Easy Power.
2. EDSA Micro Corporation.
3. Electrical Transient Analysis Program (ETAP) .
4. 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" 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, actual equipment ratings, 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/mitigation of all equipment with incident energy level above 8 cal/cm$^2$.

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 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.

B. For existing electrical systems, examine existing overcurrent protection devices. Record all existing overcurrent device settings. Record existing overcurrent device data including: Manufacturer, Model Numbers, Tripping Devices, etc.

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. If existing studies other sources are used, Contractor shall verify existing overcurrent device settings.

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents".
2. Coordination Study Report Contents: As specified in "Coordination Study Report Contents".

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 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.

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.

J. For calculated arc flash level above 8 cal/cm$^2$, the Contractor shall make recommendations to mitigate the available incident energy to lower the arc flash level to "Level 2" (8 cal/cm$^2$) or below. Contractor shall incorporate the recommended mitigation methods into the arc flash analysis to demonstrate the effectiveness of those methods and properly coordinated protective devices in Protective Device Coordination Study. Contractor shall submit the revised analysis and the original analysis for review and approval. Contractor shall be responsible for incorporating the arc flash mitigation recommendations as part of the equipment submittal for approval.

## 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. Call discrepancies to Architect's attention.
2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.

## 3.4 LABELING

A. Apply one arc-flash label on the front cover of each section of the equipment and on side or rear covers with accessible live parts and hinged doors or removable plates 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. Motor-control center.
2. Low-voltage switchboard.
3. Switchgear.
4. Medium-voltage switch.
5. Medium voltage transformers.
6. Low voltage transformers.
7. Panelboard and safety switch over 250 V.
8. Applicable panelboard and safety switch under 250 V.
9. Control panel.

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 260573.19

# SECTION 262213 - LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Distribution, dry-type transformers with nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

### 1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and size of transformer.
b. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.

B. Shop Drawings:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of field connections.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
3. Include diagrams for power, signal, and control wiring.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

### 1.3 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Inspection: On receipt, inspect for and note shipping damage to packaging and transformer.

1. If manufacturer packaging is removed for inspection, and transformer will be stored after inspection, re-package transformer using original or new packaging materials that provide protection equivalent to manufacturer's packaging.

B. Storage: Store in warm, dry, and temperature-stable location in original shipping packaging.

C. Temporary Heating: Apply temporary heat in accordance with manufacturer's published instructions within enclosure of ventilated-type units, throughout periods during which equipment is not energized and when transformer is not in space that is continuously under normal control of temperature and humidity.

D. Handling: Follow manufacturer's instructions for lifting and transporting transformers.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Square D; Schneider Electric USA
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.

B. Source Limitations: Obtain each type of transformer from single source from single manufacturer.

### 2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60 Hz service.

B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

C. Transformers Rated 15 kVA and Larger:

1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.
2. Marked as compliant with DOE 2016 efficiency levels by qualified electrical testing laboratory recognized by authorities having jurisdiction.

D. Shipping Restraints: Paint or otherwise color-code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside transformer enclosure.

## 2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70, and list and label as complying with UL 1561.

B. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

1. One leg per phase.
2. Core volume must allow efficient transformer operation at 10 percent above nominal tap voltage.
3. Grounded to enclosure.

C. Coils: Continuous windings except for taps.

1. Coil Material: Copper.
2. Internal Coil Connections: Brazed or pressure type.
3. Terminal Connections: Welded or Bolted.

D. Encapsulation: Transformers smaller than 30 kVA must have core and coils completely resin encapsulated.

E. Enclosure: Ventilated.

1. Core and coil must be encapsulated within resin compound to seal out moisture and air.
2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.
3. Wiring Compartment: Sized for conduit entry and wiring installation.
4. Environmental Protection:

   a. Indoor: UL 50E, Type 2.
   b. Hazardous Location: Compliant with requirements for Class I Division 1 space.

5. Finish Color: Gray weather-resistant enamel.

F. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

G. Insulation Class, Smaller Than 30 kVA: 180 deg C, UL-component-recognized insulation system with maximum of 115 deg C rise above 40 deg C ambient temperature.

H. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with maximum of 115 deg C rise above 40 deg C ambient temperature.

I. Grounding: Provide ground-bar kit or ground bar installed on inside of transformer enclosure.

J. Electrostatic Shielding: Windings must have independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.

1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
2. Include special terminal for grounding shield.

K. Wall Brackets: Manufacturer's standard brackets.

L. Low-Sound-Level Requirements: Maximum sound levels when factory tested in accordance with IEEE C57.12.91, as follows:

1. 9.00 kVA and Less: 40 dB(A-weighted).
2. 9.01 to 30.00 kVA: 45 dB(A-weighted).
3. 30.01 to 50.00 kVA: 45 dB(A-weighted) for K-factors of 1, 4, and 9.
4. 50.01 to 150.00 kVA: 50 dB(A-weighted) for K-factors of 1, 4, and 9.

## 2.4 IDENTIFICATION

A. Nameplates:

1. Engraved, laminated-acrylic or melamine plastic signs for distribution transformers, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."
2. Self-adhesive label for distribution transformers. Self-adhesive labels are specified in Section 260553 "Identification for Electrical Systems."

## 2.5 SOURCE QUALITY CONTROL

A. Testing Administrant: Engage qualified electrical testing agency to evaluate transformer.

B. Factory Tests and Inspections: Test and inspect assembled system, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, in accordance with IEEE C57.12.01 and IEEE C57.12.91 before delivering to site. Affix label with name and date of manufacturer's certification of system compliance on control units.

1. Resistance measurements of windings at rated voltage connections and at tap connections.
2. Ratio tests at rated voltage connections and at tap connections.
3. Phase relation and polarity tests at rated voltage connections.
4. No load losses, and excitation current and rated voltage at rated voltage connections.
5. Impedance and load losses at rated current and rated frequency at rated voltage connections.
6. Applied and induced tensile tests.
7. Regulation and efficiency at rated load and voltage.
8. Insulation-Resistance Tests:

    a. Line-side to ground.
    b. Load-side to ground.
    c. Line-side to load-side.

9. Temperature tests.
10. Factory Sound-Level Tests: Conduct prototype sound-level tests on production-line products.

C. Nonconforming Work:

1. System equipment that does not pass tests and inspections will be considered defective.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for transformers.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's published instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance must be 5 Ω at location of transformer.

E. Environment: Enclosures must be rated for environment in which they are located. Covers for UL 50E, Type 4X enclosures may not cause accessibility problems.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounted transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Coordinate installation of wall-mounted and structure-hanging supports with actual transformer provided.

B. Install transformers level and plumb on concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.

C. Construct concrete bases and anchor floor-mounted transformers in accordance with manufacturer's published instructions and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

D. Secure transformer to concrete base in accordance with manufacturer's published instructions.

E. Secure covers to enclosure and tighten bolts to manufacturer-recommended torques to reduce noise generation.

F. Remove shipping bolts, blocking, and wedges.

## 3.3 CONNECTIONS

A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals in accordance with manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Provide flexible connections at conduit and conductor terminations and supports to eliminate sound and vibration transmission to building structure.

## 3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Electrical contractor shall be permitted to perform required testing. Owner and/or Engineer shall be permitted to witness testing.

2. Small (Up to 167 kVA Single-Phase or 500 kVA Three-Phase) Dry-Type Transformer Field Tests:

a. Visual and Mechanical Inspection.

1) Inspect physical and mechanical condition.
2) Inspect anchorage, alignment, and grounding.
3) Verify that resilient mounts are free and that shipping brackets have been removed.
4) Verify that unit is clean.
5) Perform specific inspections and mechanical tests recommended by manufacturer.
6) Verify that as-left tap connections are as specified.
7) Verify presence of surge arresters and that their ratings are as specified.

b. Electrical Tests:

1) Measure resistance at windings, taps, and bolted connections.

2) Perform insulation-resistance tests winding-to-winding and windings-to-ground. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index: value of index may not be less than 1.0.
3) Perform turns-ratio tests at tap positions. Test results may not deviate by more than one-half percent from either adjacent coils or calculated ratio. If test fails, replace transformer.
4) Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.

B. Test Labeling: On completion of satisfactory testing of units, attach dated and signed "Satisfactory Test" label to tested components.

C. Nonconforming Work:

1. Transformer will be considered defective if it does not pass tests and inspections.
2. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Assemble and submit test and inspection reports.

E. Manufacturer Services:

1. Engage factory-authorized service representative to support field tests and inspections.

## 3.5 ADJUSTING

A. Record transformer secondary voltage at unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Output Settings Report: Prepare written report recording output voltages and tap settings.

## 3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

## 3.7 MAINTENANCE

A. Infrared Scanning: Two months after Substantial Completion, perform infrared scan of transformer connections.

1. Use infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.

2. Perform two follow-up infrared scans of transformers, one at four months and another at 11 months after Substantial Completion.
3. Prepare certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial actions taken, and scanning observations after remedial action.

END OF SECTION 262213

# SECTION 262416 - PANELBOARDS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Power panelboards.
2. Lighting and appliance branch-circuit panelboards.

### 1.2 DEFINITIONS

A. GFEP: Ground-fault equipment protection.

B. MCCB: Molded-case circuit breaker.

### 1.3 ACTION SUBMITTALS

A. Product Data:

1. Power panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Disconnecting and overcurrent protective devices.
4. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
5. 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 listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for series rating of installed devices.
7. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, 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. 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 Internet link for electronic access to downloadable PDF of coordination curves.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

## 1.4 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards.

B. Manufacturers' Published Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:

1. Recommended procedures for installing panelboards.
2. Recommended torque settings for bolted connections on panelboards.
3. Recommended temperature range for energizing panelboards.

C. Sample warranties.

## 1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts: Furnish to Owner spare parts, for repairing panelboards, that are packaged with protective covering for storage on-site 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.

## 1.7 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 in accordance with NEMA PB 1.

## 1.8 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed panelboards perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

A. Fabricate and test panelboards in accordance with 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 in accordance with NFPA 70, by qualified electrical testing agency recognized by authorities having jurisdiction, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Enclosures: Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

    a. Indoor Dry and Clean Locations: UL 50E, Type 1.
    b. Indoor Hazardous Location: Enclosure must comply with Class I Division 1 requirements.

2. Height: 7 ft maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims must cover live parts and may have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims must cover live parts and may 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, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. 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 A must be field convertible to main breaker.

H. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

   a. Plating must run entire length of bus.
   b. Bus must be fully rated for entire length.

2. Interiors must be factory assembled into unit. Replacing switching and protective devices may not disturb adjacent units or require removing main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure.
5. Do not mount neutral bus in gutter.

I. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations must 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 lug on neutral bar for each pole in panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with lug on bar for each pole in 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.

J. Quality-Control Label: Panelboards or load centers must be labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers must 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 must have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

L. Panelboard Short-Circuit Current Rating:

1. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for 100 percent interrupting capacity.

a. Panelboards and overcurrent protective devices rated 240 V or less must have short-circuit ratings as shown on Drawings, but not less than 10 000 A(rms) symmetrical.
b. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V must have short-circuit ratings as shown on Drawings, but not less than 14 000 A(rms) symmetrical.

## 2.2 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Square D; Schneider Electric USA.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.

B. Listing Criteria: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inch high, provide two latches, keyed alike.

D. Mains: Circuit breaker and 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.

## 2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Square D; Schneider Electric USA.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.

B. Listing Criteria: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Door-in-door construction with concealed hinges; secured with flush latch with tumbler lock; keyed alike. Inner door must permit access to breaker operating handles and labeling, but current carrying terminals and bus must remain concealed.

## 2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Square D; Schneider Electric USA
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.

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 must be recorded with type, phase, and magnitude of fault that caused 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. GFEP Circuit Breakers: Class B ground-fault protection (30 mA trip).
7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240 V, single-pole configuration.
8. Subfeed Circuit Breakers: Vertically mounted.
9. 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. Communication Capability: Circuit-breaker-mounted communication module.
h. Shunt Trip: 120 V trip coil energized from separate circuit, set to trip at 75percent of rated voltage.
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.
k. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 A must have interchangeable rating plugs or electronic adjustable trip units.
l. Auxiliary Contacts: One, SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
m. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
n. Multipole units enclosed in single housing with single handle.

## 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 in accordance with 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. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA PB 1.1.

C. Special Techniques:

1. Equipment Mounting:
   a. Attach panelboard to vertical finished or structural surface behind panelboard.
   b. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.
2. Mount top of trim 7.5 ft above finished floor unless otherwise indicated.
3. Mount panelboard cabinet plumb and rigid without distortion of box.
4. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
5. Install overcurrent protective devices and controllers not already factory installed.

   a. Set field-adjustable, circuit-breaker trip ranges.
   b. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's published instructions.

6. 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.
7. Install filler plates in unused spaces.
8. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

D. Interfaces with Other Work:

1. 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.

## 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. Panelboard Nameplates: Label each panelboard with nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

C. Device Nameplates: Label each branch circuit device in power panelboards with nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

E. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles must be located on interior of panelboard door.

F. Breaker Labels: Faceplate must list current rating, UL and IEC certification standards, and AIC rating.

G. Circuit Directory:

1. Provide directory card inside panelboard door, mounted in metal frame with transparent protective cover.

    a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.

2. Provide computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

    a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.

## 3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Tests and Inspections:

1. Electrical contractor shall be permitted to perform required testing. Owner and/or Engineer shall be permitted to witness testing.
2. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Perform optional tests. Certify compliance with test parameters.
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 infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
    c. Instruments and Equipment:

1) Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

C. Nonconforming Work:

1. Panelboards will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Collect, assemble, and submit test and inspection reports, including certified report that identifies panelboards included and that describes scanning results, with comparisons of 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 as specified in Section 260573.16 "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 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 panelboard, may not exceed 20 percent.

## 3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature in accordance with manufacturer's published instructions.

END OF SECTION 262416

# SECTION 262726 - WIRING DEVICES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. General-grade duplex straight-blade receptacles.
2. Receptacles with ground-fault protective devices.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

### 1.2 ACTION SUBMITTALS

A. Product Data:

1. Duplex straight-blade receptacles.
2. Receptacles with GFCI device.

B. Field Quality-Control Submittals:

1. Field quality-control reports.

### 1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Instructions: Record copy of official installation instructions issued to Installer by manufacturer for the following:

1. Duplex straight-blade receptacles.
2. Receptacles with GFCI device.

B. Sample warranties.

## PART 2 - PRODUCTS

### 2.1 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

A. Duplex Straight-Blade Receptacle:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    b. Pass & Seymour; Legrand North America, LLC.

2. Regulatory Requirements:

    a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. General Characteristics:

    a. Reference Standards: UL CCN RTRT and UL 498.

4. Options:

    a. Device Color: .Match existing wiring device color in space.
    b. Configuration:

        1) General-duty, smooth face, NEMA 5-20R.

5. Accessories:

    a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching existing wall plates in space; from same manufacturer as wiring device.
    b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

## 2.2 RECEPTACLES WITH GROUND-FAULT PROTECTIVE DEVICES

A. General-Grade, Straight-Blade Receptacle with GFCI Device:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    b. Pass & Seymour; Legrand North America, LLC.

2. Regulatory Requirements:

    a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. General Characteristics:

a. Reference Standards: UL CCN KCXS, UL 498, and UL 943.

4. Options:

a. Device Color: Match existing wiring device color in space.
b. Configuration: Heavy-duty, NEMA 5-20R.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching existing wall plates in space; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wall plate finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receptacles:

1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

A. Comply with manufacturer's instructions.

B. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Receptacle Orientation: Unless otherwise indicated in Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.

C. Identification:

1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

A. Tests and Inspections:

1. Electrical contractor shall be permitted to perform required testing. Owner and/or Engineer shall be permitted to witness testing.

2. Insert and remove test plug to verify that device is securely mounted.
3. Verify polarity of hot and neutral pins.
4. Measure line voltage.
5. Measure percent voltage drop.
6. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.

B. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

3.4 PROTECTION

A. Devices:

1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 262726

ARLINGTON VIRGINIA

DEPARTMENT OF
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# ISSUED FOR CONSTRUCTION AUGUST 7, 2023

# Plans For:

## ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

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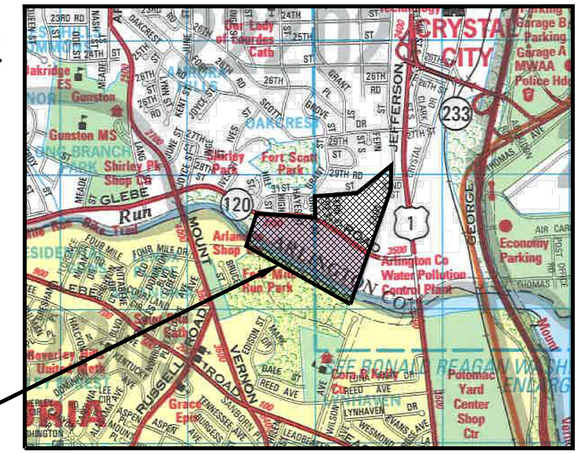
# Location Map

Scale: 1"=1000'

## Vicinity


CRYSTAL CITY
JEFFERSON
GLEBE
Run
Fort Scott Park
Arlington Co Water Pollution Control Plant
Potomac Yard Center Shop Ctr
Economy Parking
Gunston MS
Shirley Pk
Shop Ctr
Arlington Shop
Run Park
Grace Eng
VERNON
RUSSELL ROAD
REED AVE
LYNHAVEN
Lady of Sorrows Cath
Gunston
Heverley Park Undergrnd
23RD RD
24TH
25TH
26TH
28TH
29TH RD
OAKCREST
BRANCH
PARK
MOUNT
GEORGE
THOMAS
AIR CAR
POST OFFICE
Mount
233
120
1
3500
Corp Park Dr
Corp Park Dr
Corp Park Dr

# Phase 1:

A. PHASE 1A (OUTAGE REQUIRED AT STEPS A.2 THRU A.4)
- A.1. INSTALL NEW PANEL PPD.
- A.2. PROVIDE NEW 125A, 3-POLE CIRCUIT BREAKER AT EX PNL MDB. (FULL OUTAGE)
- A.3. EXTEND TEMPORARY FEEDER FROM EX PNL MDB TO NEW PNL PPD. (FULL OUTAGE)
- A.4. EXTEND EX BRANCH CIRCUITS FROM EX PNL PPD TO NEW PNL PPD. (PARTIAL OUTAGE)
- A.5. ENERGIZE NEW PNL PPD.
- A.6. REMOVE EX PNL PPD.

B. PHASE 1B (OUTAGE REQUIRED AT PILOT ROOM FOR THIS PHASE; OUTAGES REQUIRED AT STEPS B.2 THRU B.7).
- B.1. INSTALL NEW PANEL LPD.
- B.2. REMOVE EX 15 KVA XFMR.
- B.3. INSTALL NEW 45 KVA XFMR.
- B.4. INSTALL PRIMARY AND SECONDARY FEEDER FROM NEW 45 KVA XFMR TO NEW PNL PPD AND NEW PNL LPD, RESPECTIVELY.
- B.5. EXTEND EX BRANCH CIRCUITS FROM EX PNL LPD TO NEW PNL LPD.
- B.6. ENERGIZE NEW PNL LPD.
- B.7. REMOVE EX PNL LPD.

C. PHASE 1C (NO OUTAGES REQUIRED)
- C.1. INSTALL NEW PANEL PPC SECTIONS 1 & 2 IN 3RD FLOOR ELEC RM 323.
- C.2. INSTALL NEW 225 KVA XFMR AT 1ST FLR ELEC RM 117.
- C.3. INSTALL NEW PANEL DB AT 2ND FLR ELEC RM 216.
- C.4. INSTALL SECONDARY FEEDER FROM NEW 225 KVA XFMR TO NEW PANEL DB.
- C.5. INSTALL NEW FEEDER TO NEW PANEL PPC FROM NEW PANEL DB.
- C.6. INSTALL NEW PANEL MDB AT 1ST FLR ELEC RM 117.
- C.7. INSTALL PRIMARY FEEDER TO NEW 225 KVA XFMR FROM NEW PANEL MDB.
- C.8. INSTALL NEW FEEDER FROM NEW PANEL MDB TO EX ATS LOCATION. TERMINATE NEW FEEDER IN JUNCTION BOX ADJACENT TO EX ATS FOR FUTURE EXTENSION.

D. PHASE 1D (FULL OUTAGE REQUIRED FOR STEPS D.1 THRU D.3; PARTIAL OUTAGE REQUIRED FOR STEPS D.7 THRU D.10).
- D.1. DE-ENERGIZE EX INCOMING FEEDER B.
- D.2. DISCONNECT EX FEEDER B ON LOAD SIDE OF EX 'B' ECB.
- D.3. INSTALL NEW FEEDER B CONDUCTORS FROM EX 'B' ECB LOAD TERMINALS TO NEW PANEL MDB.
- D.4. ENERGIZE NEW PANEL MDB VIA TEMPORARY FEEDER B.
- D.5. ENERGIZE NEW 225 KVA XFMR
- D.6. ENERGIZE NEW PANEL DB.
- D.7. RE-WIRE EXISTING PUSHBUTTON AT LAB TO NEW SHUNT TRIP MAIN CIRCUIT BREAKER AT NEW PANEL PPC.
- D.8. EXTEND EX BRANCH CIRCUITS FROM EX PANEL PPC TO NEW PANEL PPC.
- D.9. ENERGIZE NEW PANEL PPC.
- D.10. DISCONNECT AND REMOVE EX PANEL PPC FEEDER BACK TO EX PANEL DB.
- D.11. REMOVE EX PANEL PPC.
- D.12. REMOVE EX 3-POLE CONTACTOR.

E. PHASE 1E (PARTIAL OUTAGE REQUIRED FOR STEPS E.2 THRU E.3 AND STEP E.6).
- E.1. INSTALL NEW PANEL LPC AT 3RD FLR ELEC RM 323.
- E.2. MODIFY AND EXTEND EX FEEDER SUCH THAT NEW PANEL LPC IS FED FROM NEW PANEL DB.
- E.3. EXTEND EX BRANCH CIRCUITS FROM EX PANEL LPC TO NEW PANEL LPC.
- E.4. ENERGIZE NEW PANEL LPC.
- E.5. REMOVE EX PANEL LPC.
- E.6. REMOVE EX PANEL LPC FEEDER BACK TO EX PANEL DB.

F. PHASE 1F (PARTIAL OUTAGE REQUIRED FOR STEPS F.2 THRU F.3 AND STEP F.6).
- F.1. INSTALL NEW PANEL LPE AT 1ST FLR ELEC RM 117.
- F.2. MODIFY AND EXTEND EX FEEDER SUCH THAT NEW PNL LPE IS FED FROM NEW PANEL DB.
- F.3. EXTEND BRANCH CIRCUITS FROM EX PNL LPE TO NEW PNL LPE.
- F.4. ENERGIZE NEW PANEL LPE.
- F.5. REMOVE EX PANEL LPE.
- F.6. REMOVE EX PANEL LPE FEEDER BACK TO EX PNL DB.

G. PHASE 1G (PARTIAL OUTAGE REQUIRED AT STEPS G.2 THRU G.3 AND STEP G.6).
- G.1. INSTALL NEW PANEL LPA SECT 1 & 2 AT 1ST FLR ELEC RM 117.
- G.2. MODIFY AND EXTEND EX FEEDER SUCH THAT NEW PANEL LPA SECT 1 IS FED FROM NEW PNL DB. PANEL LPA SECT 2 IS FED VIA FEED THRU LUGS AT PANEL LPA SECT 1.
- G.3. EXTEND BRANCH CIRCUITS FROM EX PANEL LPA TO NEW PANEL LPA.
- G.4. ENERGIZE NEW PANEL LPA.
- G.5. REMOVE EX PANEL LPA.
- G.6. REMOVE EX PNL LPA FEEDER BACK TO EX PNL DB.

H. PHASE 1H (PARTIAL OUTAGE REQUIRED FOR STEPS H.1 THRU H.6; FULL OUTAGE REQUIRED FOR STEPS H.7 THRU H.8).
- H.1. PROVIDE TEMPORARY FEEDER FROM NEW PNL DB TO EX PNL LPB.
- H.2. DE-ENERGIZE AND REMOVE EX FEEDER FROM EX PNL DB TO EX PNL LPB.
- H.3. PROVIDE TEMPORARY FEEDER FROM NEW PNL DB TO EX PNL PPE.
- H.4. DE-ENERGIZE AND REMOVE EX FEEDER FROM EX PNL DB TO EX PNL PPE.
- H.5. PROVIDE TEMPORARY FEEDER FROM NEW PNL DB TO EX PNL PPG.
- H.6. DE-ENERGIZE AND REMOVE EX FEEDER FROM EX PNL DB TO EX PNL PPG.
- H.7. PROVIDE TEMPORARY FEEDER FROM NEW PNL MDB TO EX PNL PPF.
- H.8. DE-ENERGIZE AND REMOVE EX FEEDER FROM EX PNL MDB TO EX PNL PPF.

I. PHASE 1I (PARTIAL OUTAGE REQUIRED FOR STEPS I.1 THRU I.3).
- I.1. DE-ENERGIZE EX PANEL PPJ.
- I.2. DISCONNECT EX PANEL PPJ FEEDER AT EX PANEL DB.
- I.3. EXTEND EX PANEL PPJ FEEDER TO NEW PANEL DB.
- I.4. ENERGIZE EX PANEL PPJ.

# Phase 2:

A. PHASE 2A (FULL OUTAGE REQUIRED FOR STEP A.1).
- A.1. DISCONNECT AND REMOVE EX 225 KVA XFMR PRIMARY & SECONDARY FEEDERS.
- A.2. REMOVE EX 225 KVA XFMR.
- A.3. REMOVE EX PANEL DB.

B. PHASE 2B (FULL OUTAGE REQUIRED FOR STEP B.2; PARTIAL OUTAGE FOR STEP B.3; FULL OUTAGE FOR STEP B.6).
- B.1. INSTALL NEW PANEL PPB IN 2ND FLR ELEC RM 216 IN EX 225 KVA XFMR LOCATION.
- B.2. MODIFY AND EXTEND EX FEEDER SUCH THAT NEW PANEL PPB IS FED FROM NEW PANEL MDB.
- B.3. EXTEND EX BRANCH CIRCUITS FROM EX PANEL PPB TO NEW PANEL PPB.
- B.4. ENERGIZE NEW PANEL PPB.
- B.5. REMOVE EX PANEL PPB.
- B.6. REMOVE EX PANEL PPB FEEDER BACK TO EX PNL MDB.

C. PHASE 2C (PARTIAL OUTAGE REQUIRED FOR STEPS C.2 THRU C.4).
- C.1. INSTALL NEW PANEL PPE IN EX PANEL PPB LOCATION AT 2ND FLR ELEC RM 216.
- C.2. INSTALL NEW FEEDER FROM NEW PANEL DB TO NEW PANEL PPE.
- C.3. EXTEND BRANCH CIRCUITS FROM EX PNL PPE TO NEW PNL PPE.
- C.4. REMOVE TEMPORARY FEEDER FROM NEW PNL DB.
- C.5. ENERGIZE PANEL PPE.
- C.6. REMOVE EX PANEL PPE.

D. PHASE 2D (PARTIAL OUTAGE REQUIRED FOR STEPS D.2, D.3 AND D.5).
- D.1. INSTALL NEW PANEL LPB SECT 1 & 2 AT 2ND FLR ELEC RM 216.
- D.2. INSTALL NEW FEEDER FROM NEW PANEL DB TO NEW PANEL LPB.
- D.3. EXTEND EX BRANCH CIRCUITS FROM EX PANEL LPB TO NEW PANEL LPB.
- D.4. ENERGIZE NEW PANEL LPB.
- D.5. DISCONNECT TEMPORARY FEEDER FROM NEW PANEL DB TO EX PANEL LPB.
- D.6. REMOVE EX PANEL LPB SECT 1 & 2.

E. PHASE 2E (PARTIAL OUTAGE REQUIRED FOR STEPS E.2, E.4 AND E.6).
- E.1. INSTALL NEW PANEL PPG AT 2ND FLR A/C RM 201.
- E.2. INSTALL NEW FEEDER FROM NEW PANEL DB TO NEW PANEL PPG.
- E.3. PRIOR TO TAKING PANEL PPG EX BRANCH CIRCUITS OFFLINE, PROVIDE TEMPORARY POWER SOURCE FOR ALL EX UPS BRANCH CIRCUITS FED FROM EX PPG FOR DURATION OF PANEL OUTAGE. TEMPORARY POWER SOURCE TO BE PROVIDED IN FORM OF POWER CORDS EXTENDED FROM AREAS WITH ENERGIZED RECEPTACLES.
- E.4. EXTEND EX BRANCH CIRCUITS FROM EX PANEL PPG TO NEW PANEL PPG.
- E.5. ENERGIZE NEW PANEL PPG.
- E.6. DISCONNECT TEMPORARY FEEDER FROM NEW PANEL DB TO EX PNL PPG.
- E.7. REMOVE EX PANEL PPG.

# Phase 3:

A. PHASE 3A (PARTIAL OUTAGE REQUIRED FOR STEP A.2; FULL OUTAGE REQUIRED FOR STEPS A.3 THRU A.4).
- A.1. PRIOR TO TAKING EX PANEL PPX OFFLINE, PROVIDE TEMPORARY POWER SOURCE FOR ALL EX UPS BRANCH CIRCUITS FED FROM EX PNL LPX FOR DURATION OF PANEL OUTAGE.
- A.2. DE-ENERGIZE EX PANEL PPX.
- A.3. MODIFY AND EXTEND EX PANEL PPX FEEDER FROM EX PNL MDB TO NEW PNL MDB.
- A.4. REMOVE EX FEEDER BACK TO EX PNL MDB.
- A.5. ENERGIZE EX PANEL PPX.

B. PHASE 3B (FULL OUTAGE REQUIRED FOR STEP B.2; PARTIAL OUTAGE REQUIRED FOR STEP B.3; FULL OUTAGE REQUIRED FOR STEP B.5)
- B.1. INSTALL NEW PANEL PPF.
- B.2. INSTALL NEW FEEDER FROM NEW PNL MDB TO NEW PNL PPF.
- B.3. EXTEND EX BRANCH CIRCUITS FROM EX PNL PPF TO NEW PNL PPF.
- B.4. ENERGIZE NEW PNL PPF.
- B.5. REMOVE TEMPORARY FEEDER FROM EX PANEL PPF BACK TO NEW PNL MDB.
- B.6. REMOVE EX PNL PPF.

C. PHASE 3C (FULL OUTAGE REQUIRED FOR STEP C.2; PARTIAL OUTAGE REQUIRED FOR STEP C.3; FULL OUTAGE REQUIRED FOR STEP C.5).
- C.1. INSTALL NEW PANEL PPA AT 1ST FLR ELEC RM 117.
- C.2. INSTALL NEW FEEDER FROM NEW PANEL MDB TO NEW PANEL PPA.
- C.3. EXTEND EXISTING BRANCH CIRCUITS FROM EX PANEL PPA TO NEW PANEL PPA.
- C.4. ENERGIZE NEW PANEL PPA.
- C.5. DISCONNECT AND REMOVE FEEDER FROM EX PNL MDB TO EX PNL PPA.
- C.6. REMOVE EX PANEL PPA.

D. PHASE 3D (FULL OUTAGE REQUIRED FOR ALL STEPS)
- D.1. DE-ENERGIZE PANEL PPD.
- D.2. EXTEND PANEL PPD FEEDER FROM EX PNL MDB TO NEW PNL MDB.
- D.3. ENERGIZE PANEL PPD.

E. PHASE 3E (FULL OUTAGE REQUIRED FOR STEPS E.1 THRU E.2).
- E.1. DE-ENERGIZE EX ELEVATOR.
- E.2. EXTEND EX ELEVATOR FEEDER FROM EX PNL MDB TO NEW PNL MDB.
- E.3. ENERGIZE EX ELEVATOR.

F. PHASE 3F (FULL OUTAGE REQUIRED FOR STEPS F.1 THRU STEP F.10).
- F.1. DE-ENERGIZE FEEDER A.
- F.2. DISCONNECT EX PNL MDB FROM EX ATS.
- F.3. REMOVE EX PANEL MDB FEEDER BACK TO EX ATS.
- F.4. EXTEND NEW PNL MDB FEEDER FROM JUNCTION BOX TO EX ATS.
- F.5. TEST EX ATS TO VERIFY THAT IT IS FUNCTIONING PROPERLY.
- F.6. DE-ENERGIZE NEW PNL MDB.
- F.7. DE-ENERGIZE FEEDER B.
- F.8. DISCONNECT FEEDER B CONDUCTORS FROM NEW PNL MDB AND FROM LOAD SIDE OF EX 'B' ECB.
- F.9. ENERGIZE EX FEEDER A AND NEW PNL MDB.
- F.10. CONNECT EX FEEDER B TO LOAD SIDE OF EX 'B' ECB.
- F.11. ENERGIZE EX FEEDER B.
- F.12. REMOVE EX PNL MDB.

## PHASE 1 NOTES

1. DURING EXTENSION OF EXISTING BRANCH CIRCUITS TO NEW PANEL PPC, PROVIDE TEMPORARY POWER TO EXISTING EQUIPMENT IN LABS THAT CANNOT SUSTAIN LONG PERIODS OF TIME WITHOUT POWER (I.E. INCUBATORS AND REFRIGERATORS). PROVIDE TEMPORARY POWER CORDS FROM POWERED RECEPTACLES IN ADJACENT SPACES.
2. TRANSITION EXISTING BRANCH CIRCUITS AT PANEL PPC DURING LAB DOWNTIME AFTER HOURS DURING WEEKDAYS AFTER 4PM. COORDINATE WORK ON PANELS IN THIS AREA WITH OWNER PRIOR TO PROCEEDING. COORDINATE WITH LAB PRIOR TO SHUTDOWN TO DETERMINE IF THEY WILL REMAIN ONSITE TO MONITOR EQUIPMENT DURING THE REQUIRED SHUTDOWN.

## PHASE 2 NOTES

1. DURING EXTENSION OF EXISTING BRANCH CIRCUITS TO NEW PANEL PPG, PROVIDE TEMPORARY POWER TO EX UPS SOURCE BRANCH CIRCUITS SERVED FROM PNL PPG. PROVIDE TEMPORARY POWER CORDS FROM POWERED RECEPTACLES IN ADJACENT SPACES.
2. COORDINATE WORK AT BRANCH CIRCUITS AFFECTING EX UPS CIRCUITS WITH OWNER PRIOR TO PROCEEDING WITH MODIFICATIONS.

## PHASE 3 NOTES

1. DURING MODIFICATIONS TO PANEL PPX FEEDER, PROVIDE TEMPORARY POWER TO EX UPS SOURCE BRANCH CIRCUITS SERVED FROM PNL LPX. PROVIDE TEMPORARY POWER CORDS FROM POWERED RECEPTACLES IN ADJACENT SPACES.
2. COORDINATE WORK AT BRANCH CIRCUITS AFFECTING EX UPS CIRCUITS WITH OWNER PRIOR TO PROCEEDING WITH MODIFICATIONS.
3. DURING FINAL MODIFICATIONS TO NEW PANEL MDB FEEDER, PROVIDE TEMPORARY POWER SOURCE FOR PANEL LPX AND PANEL PPG FOR LAB EQUIPMENT AND UPS SOURCE CIRCUITS. PROVIDE TEMPORARY POWER SOURCE FOR PANEL LPC AND PPC AS REQUIRED. COORDINATE TEMPORARY POWER SOURCE REQUIREMENTS WITH OWNER AND LAB USERS PRIOR TO POWER OUTAGE.

## GENERAL NOTES

1. REFER TO DRAWING G-1 FOR ELECTRICAL GENERAL NOTES, SYMBOLS, LEGEND AND ABBREVIATIONS.
2. REFER TO DRAWINGS E-6 THRU E-10 FOR PHASING RISER DIAGRAMS AND PHASING NOTE DESIGNATIONS.
3. REFER TO DRAWINGS E-11 THRU E-16 FOR PANELBOARD SCHEDULES.
4. OFF-HOURS WORK SHALL OCCUR ON WEEKDAYS AFTER 5 PM. COORDINATE WITH ARLINGTON COUNTY TO DETERMINE REQUIRED NOTIFICATION IN ADVANCE FOR WORK THAT SHALL OCCUR DURING OFF HOURS.
5. COORDINATE WORK ON EXISTING PANELS WITH ARLINGTON COUNTY PRIOR TO PROCEEDING. THIS SHALL INCLUDE DISCONNECTION OF EXISTING PANELS, TRANSITIONING OF EXISTING BRANCH CIRCUITS FROM EXISTING PANELS TO NEW PANELS AND REMOVAL OF EXISTING PANELS.
6. CONTRACTOR SHALL TRACE OUT AND CONFIRM EXISTING BRANCH CIRCUITS FOR PANELBOARDS WHERE EXISTING BRANCH CIRCUITS ARE RELOCATED TO A NEW PANELBOARD.
7. PRIOR TO SHUTDOWNS FOR SWITCHING OVER OF POWER SOURCES FOR NEW AND EXISTING PANELBOARDS, ROUTE FEEDER CONDUIT AND CONDUCTORS TO MINIMIZE THE LENGTH OF THE OUTAGE. INSTALL ALL ASSOCIATED CONDUIT, BOXES, SUPPORTS, APPURTENANCES AND WIRING IN ORDER TO MINIMIZE REQUIRED SHUTDOWNS.
8. PROVIDE TEMPORARY LIGHTING AND TEMPORARY POWER FOR TOOLS AS REQUIRED DURING OUTAGES.

## HAZARDOUS LOCATION GENERAL NOTES

1. IN CLASS I DIVISION 2 HAZARDOUS LOCATION, WIRING METHODS SHALL COMPLY WITH NEC 501.10(A) AND 501.10(B). RIGID GALVANIZED STEEL CONDUIT (RGS) SHALL BE PERMITTED FOR USE WHEN PROVIDED WITH LISTED THREADED OR THREADLESS FITTING. WIREWAYS SHALL BE OF THE ENCLOSED GASKETED TYPE. METAL CONDUIT MUST PROVIDE SUFFICIENT CORROSION RESISTANCE FOR USE WITHIN THE HAZARDOUS LOCATION.
2. BOXES AND FITTINGS WITHIN THE HAZARDOUS AREA ARE NOT REQUIRED TO BE EXPLOSIONPROOF EXCEPT AS REQUIRED BY NEC 501.105(B)(2), 501.115(B)(1) AND 501.150(B)(1).
3. PROVIDE CONDUIT SEALS AT CONNECTIONS TO ENCLOSURES THAT ARE REQUIRED TO BE EXPLOSIONPROOF. CONDUIT SEALS SHALL BE INSTALLED WITHIN 18-INCHES OF THE ENCLOSURE. PROVIDE THREADED COUPLINGS OR EXPLOSIONPROOF FITTING BETWEEN THE SEALING FITTING AND THE EXPLOSIONPROOF ENCLOSURE. NO OTHER TYPES OF COUPLINGS OR FITTINGS ARE PERMITTED. INSTALLATION OF CONDUIT SEALS SHALL COMPLY WITH NEC 501.15(B).
4. A CONDUIT SEAL IS REQUIRED IN EACH CONDUIT LEAVING A CLASS I DIVISION 2 SPACE. THE SEAL CAN BE INSTALLED ON EITHER SIDE OF THE BOUNDARY WITHIN TEN FEET OF THE BOUNDARY. THE SEAL SHALL BE DESIGNED AND INSTALLED TO MINIMIZE THE AMOUNT OF GAS OR VAPOR WITHIN THE PORTION OF THE CONDUIT IN HAZARDOUS LOCATION THAT CAN BE COMMUNICATED BEYOND THE SEAL. RGS CONDUIT SHALL BE USED BETWEEN THE SEALING FITTING AND THE POINT WHERE THE CONDUIT LEAVES THE HAZARDOUS LOCATION SPACE. IN ADDITION, A THREADED CONNECTION SHALL BE USED AT THE SEALING FITTING. THE CONDUIT RUN BETWEEN THE CONDUIT SEALAND THE HAZARDOUS LOCATION BOUNDARY SHALL NOT CONTAIN ANY UNIONS, COUPLINGS, BOXES OR OTHER FITTINGS EXCEPT AS PERMITTED BY NEC.
5. GROUNDING AND BONDING WITHIN THE HAZARDOUS SPACE MUST COMPLY WITH NEC 250, NEC 501.30(A) AND 501.30(B).
6. IF SURGE PROTECTION IS PROVIDED WITHIN THE HAZARDOUS LOCATION SPACE, THE DEVICES SHALL BE NON-ARCING.
7. PER NEC 501.115(B), ANY CIRCUIT BREAKERS, SWITCHES, FUSES, PANELBOARDS, ETC. SHALL BE ENCLOSED IN ENCLOSURES RATED FOR USE IN CLASS I DIVISION 1 HAZARDOUS LOCATIONS.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IL HWAN KIM
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PROFESSIONAL ENGINEER

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|---|---|
| DESIGN TEAM SUPERVISOR | |
| CHIEF ENGINEERING BUREAU | |
| CHIEF WATER, SEWER STREETS BUREAU | |
| DEPARTMENT OF TRANSPORTATION | |

| Revisions | Date |
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Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

PHASING NOTES

Designed: IHK
Drawn: AGT
Checked: IHK
Miss Utility Transmittal #:

Filename: 90258015-G02.dwg
Path: N:\90258-015\CADD\
Plotted: Aug 07, 2023
Plotted by: cwolfe

Scale: NONE

Date: AUGUST 7, 2023

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Sheet
G-2


WRA
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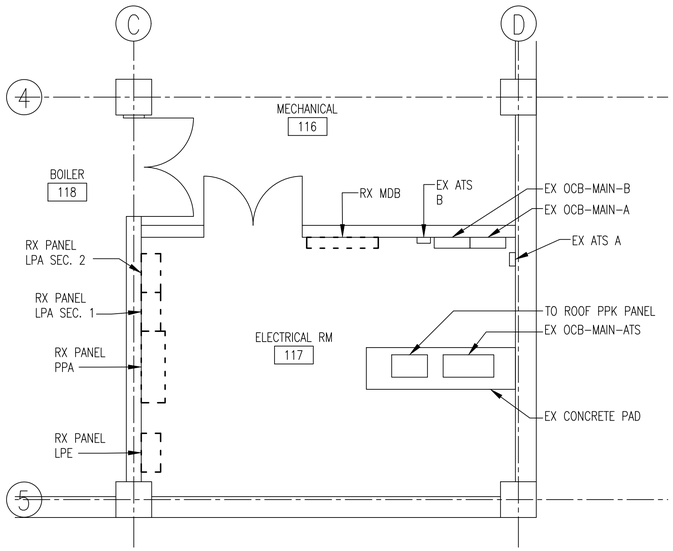
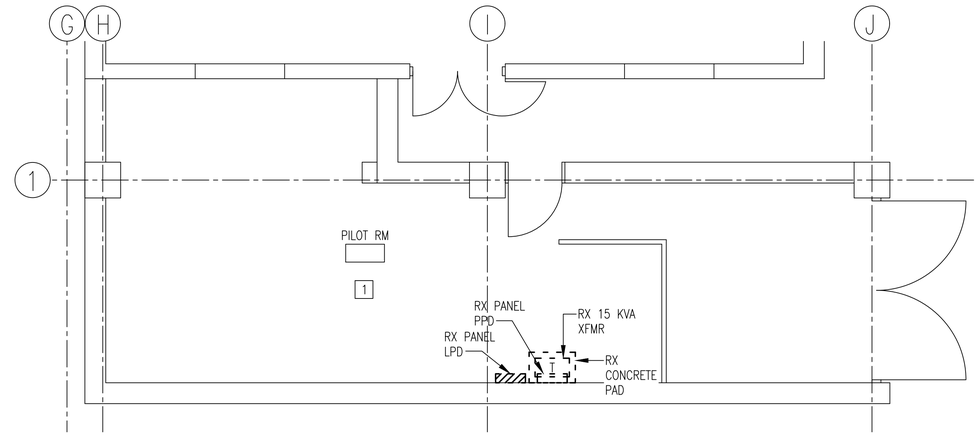
801 South Caroline Street, Baltimore, Maryland 21231



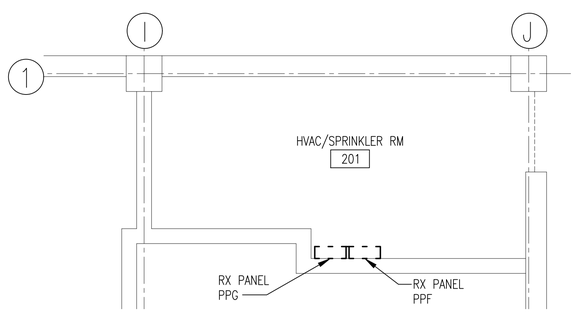

1 E-1 ENLARGED GROUND FLOOR A PART PLAN – DEMOLITION
SCALE: 1/4" = 1'-0"



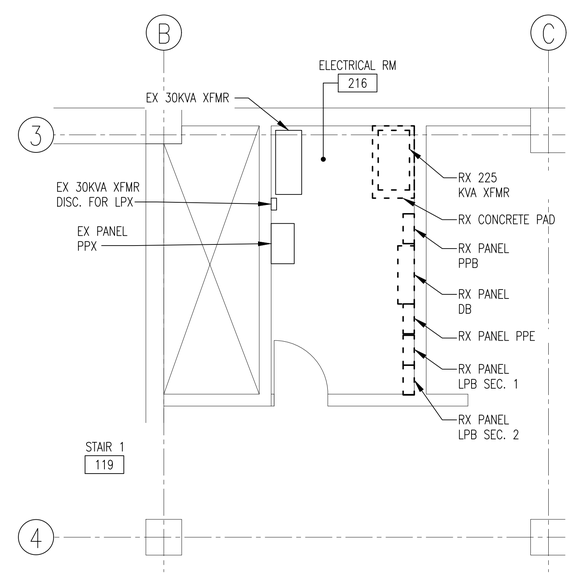

2 E-1 ENLARGED GROUND FLOOR B PART PLAN – DEMOLITION
SCALE: 1/4" = 1'-0"

## SPECIFIC NOTES

1 CLASS I DIVISION 2 HAZARDOUS LOCATION.




3 E-1 ENLARGED SECOND FLOOR C PART PLAN – DEMOLITION
SCALE: 1/4" = 1'-0"




4 E-1 ENLARGED SECOND FLOOR D PART PLAN – DEMOLITION
SCALE: 1/4" = 1'-0"

## GENERAL NOTES

1. REFER TO DRAWING G-1 FOR ELECTRICAL GENERAL NOTES, SYMBOLS, LEGEND AND ABBREVIATIONS.
2. REFER TO DRAWING G-2 FOR PHASING OF REPLACEMENT OF THE ELECTRICAL DISTRIBUTION SYSTEM.
3. REFER TO DRAWINGS E-6 THRU E-10 FOR PHASING RISER DIAGRAMS.
4. REFER TO DRAWINGS E-11 THRU E-16 FOR PANELBOARD SCHEDULES.

## HAZARDOUS LOCATION GENERAL NOTES

1. IN CLASS I DIVISION 2 HAZARDOUS LOCATION, WIRING METHODS SHALL COMPLY WITH NEC 501.10(A) AND 501.10(B). RIGID GALVANIZED STEEL CONDUIT (RGS) SHALL BE PERMITTED FOR USE WHEN PROVIDED WITH LISTED THREADED OR THREADLESS FITTING. WIREWAYS SHALL BE OF THE ENCLOSED GASKETED TYPE. METAL CONDUIT MUST PROVIDE SUFFICIENT CORROSION RESISTANCE FOR USE WITHIN THE HAZARDOUS LOCATION.
2. BOXES AND FITTINGS WITHIN THE HAZARDOUS AREA ARE NOT REQUIRED TO BE EXPLOSIONPROOF EXCEPT AS REQUIRED BY NEC 501.105(B)(2), 501.115(B)(1) AND 501.150(B)(1).
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4. A CONDUIT SEAL IS REQUIRED IN EACH CONDUIT LEAVING A CLASS I DIVISION 2 SPACE. THE SEAL CAN BE INSTALLED ON EITHER SIDE OF THE BOUNDARY WITHIN TEN FEET OF THE BOUNDARY. THE SEAL SHALL BE DESIGNED AND INSTALLED TO MINIMIZE THE AMOUNT OF GAS OR VAPOR WITHIN THE PORTION OF THE CONDUIT IN HAZARDOUS LOCATION THAT CAN BE COMMUNICATED BEYOND THE SEAL. RGS CONDUIT SHALL BE USED BETWEEN THE SEALING FITTING AND THE POINT WHERE THE CONDUIT LEAVES THE HAZARDOUS LOCATION SPACE. IN ADDITION, A THREADED CONNECTION SHALL BE USED AT THE SEALING FITTING. THE CONDUIT RUN BETWEEN THE CONDUIT SEALAND THE HAZARDOUS LOCATION BOUNDARY SHALL NOT CONTAIN ANY UNIONS, COUPLINGS, BOXES OR OTHER FITTINGS EXCEPT AS PERMITTED BY NEC.
5. GROUNDING AND BONDING WITHIN THE HAZARDOUS SPACE MUST COMPLY WITH NEC 250, NEC 501.30(A) AND 501.30(B).
6. IF SURGE PROTECTION IS PROVIDED WITHIN THE HAZARDOUS LOCATION SPACE, THE DEVICES SHALL BE NON-ARCING.
7. PER NEC 501.115(B), ANY CIRCUIT BREAKERS, SWITCHES, FUSES, PANELBOARDS, ETC. SHALL BE ENCLOSED IN ENCLOSURES RATED FOR USE IN CLASS I DIVISION 1 HAZARDOUS LOCATIONS.


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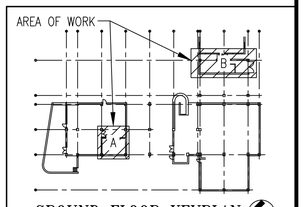
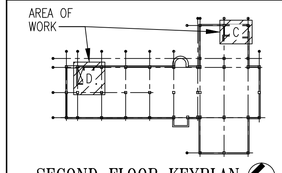
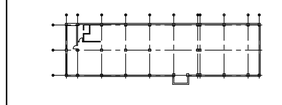



GROUND FLOOR KEYPLAN




SECOND FLOOR KEYPLAN



THIRD FLOOR KEYPLAN

## GRAPHIC SCALE

0 2' 4' 8'
SCALE: 1/4" = 1'-0"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IL HWAN KIM
Lic. No. 036555
8-7-23
PROFESSIONAL ENGINEER

| Approvals | Date |
|---|---|
| DESIGN TEAM SUPERVISOR | |
| CHIEF ENGINEERING BUREAU | |
| CHIEF WATER, SEWER STREETS BUREAU | |
| DEPARTMENT OF TRANSPORTATION | |

| Revisions | Date |
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Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

ELECTRICAL ENLARGED PLANS - DEMOLITION

Designed: IHK
Drawn: AGT
Checked: IHK
Miss Utility Transmittal #:

Filename: 90258015-E01.dwg
Path: N:\90258-015\CADD\
Plotted: Aug 07, 2023
Plotted by: cwolfe

Scale: 1/4" = 1'-0"

Date: AUGUST 7, 2023

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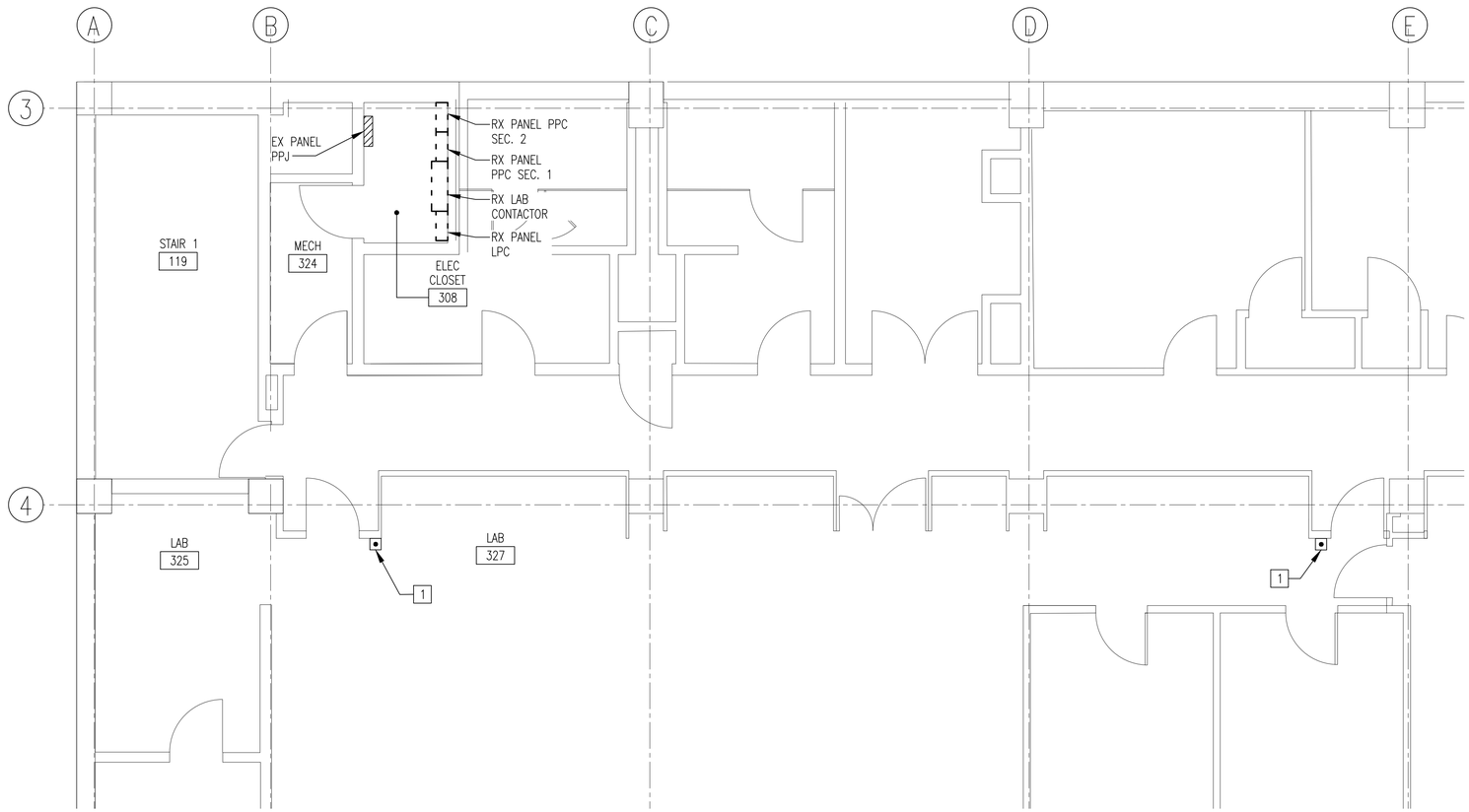
Sheet
E-1




5 / E-1 ENLARGED THIRD FLOOR A PART PLAN - DEMOLITION
SCALE: 1/4" = 1'-0"

## GENERAL NOTES

1. REFER TO DRAWING G-1 FOR ELECTRICAL GENERAL NOTES, SYMBOLS, LEGEND AND ABBREVIATIONS.
2. REFER TO DRAWING G-2 FOR PHASING OF REPLACEMENT OF THE ELECTRICAL DISTRIBUTION SYSTEM.
3. REFER TO DRAWINGS E-6 THRU E-10 FOR PHASING RISER DIAGRAMS.
4. REFER TO DRAWINGS E-11 THRU E-16 FOR PANELBOARD SCHEDULES.

## SPECIFIC NOTES

1 DISCONNECT EX PUSHBUTTON FROM RX LAB CONTACTOR AND RETAIN FOR REUSE.


ARLINGTON VIRGINIA

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8-7-23
PROFESSIONAL ENGINEER

| Approvals | Date |
|---|---|
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| DEPARTMENT OF TRANSPORTATION | |

| Revisions | Date |
|---|---|
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WRA
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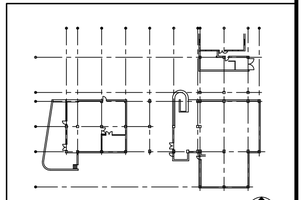
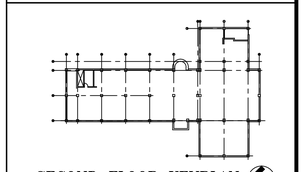
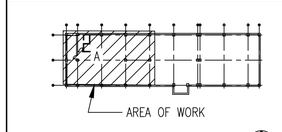
801 South Caroline Street, Baltimore, Maryland 21231

GROUND FLOOR KEYPLAN



SECOND FLOOR KEYPLAN




THIRD FLOOR KEYPLAN

GRAPHIC SCALE
0 2' 4' 8'
SCALE: 1/4" = 1'-0"

Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

ELECTRICAL ENLARGED PLANS - DEMOLITION

Designed: IHK
Drawn: AGT
Checked: IHK
Miss Utility Transmittal #:

Filename: 90258015-E02.dwg
Path: N:\90258-015\CADD\
Plotted: Aug 07, 2023
Plotted by: cwolfe

Scale: 1/4" = 1'-0"

Date: AUGUST 7, 2023

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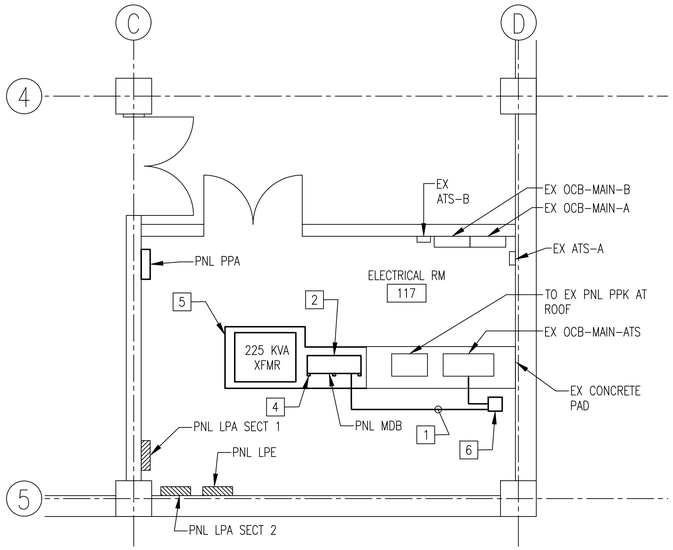
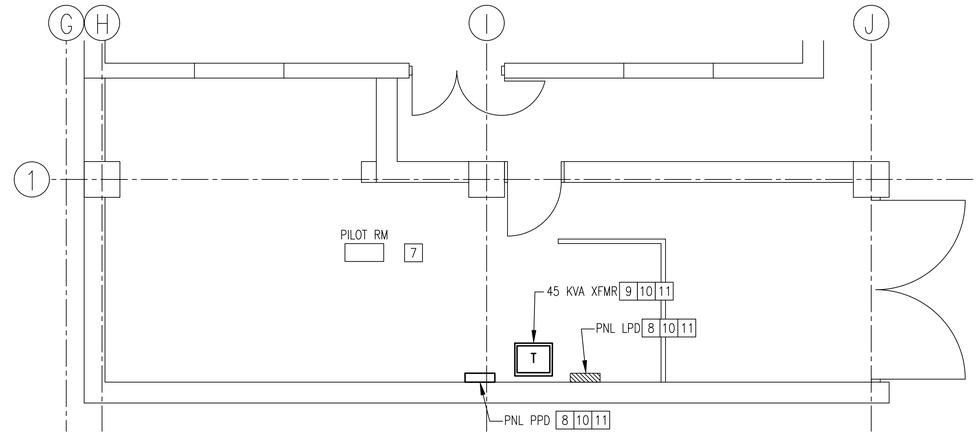



1 E-2 ENLARGED GROUND FLOOR A PART PLAN - NEW WORK
SCALE: 1/4" = 1'-0"




2 E-2 ENLARGED GROUND FLOOR B PART PLAN - NEW WORK
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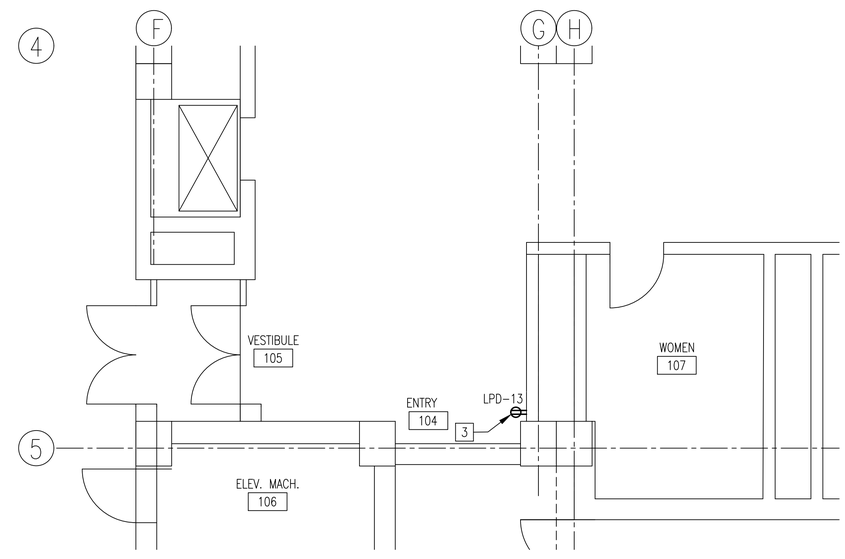


3 E-2 ENLARGED GROUND FLOOR C PART PLAN - NEW WORK
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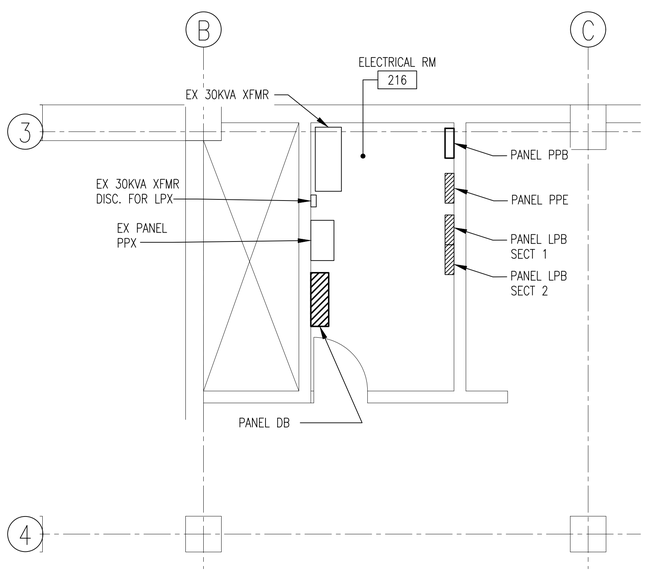
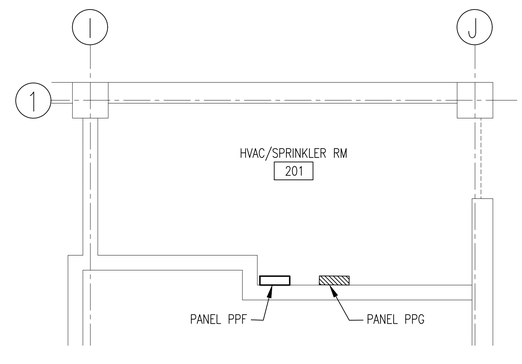



4 E-2 ENLARGED SECOND FLOOR E PART PLAN - NEW WORK
SCALE: 1/4" = 1'-0"




5 E-2 ENLARGED SECOND FLOOR D PART PLAN - NEW WORK
SCALE: 1/4" = 1'-0"

## GENERAL NOTES

1. REFER TO DRAWING G-1 FOR ELECTRICAL GENERAL NOTES, SYMBOLS, LEGEND AND ABBREVIATIONS.
2. REFER TO DRAWING G-2 FOR PHASING OF ELECTRICAL DISTRIBUTION SYSTEM REPLACEMENT AND FOR HAZARDOUS LOCATION GENERAL NOTES.
3. REFER TO DRAWINGS E-6 THRU E-10 FOR PHASING RISER DIAGRAMS.
4. REFER TO DRAWINGS E-11 THRU E-16 FOR PANELBOARD SCHEDULES.
5. REFER TO DRAWING E-1 FOR HAZARDOUS LOCATION GENERAL NOTES.

## SPECIFIC NOTES

1. ROUTE NEW PANEL MDB FEEDER TO JUNCTION BOX LOCATED ADJACENT TO EX ATS. EXTEND FEEDER TO EX ATS WHERE INDICATED BY PHASING.
2. PROVIDE TEMPORARY GENSET TO POWER NEW PNL MDB DURING CONSTRUCTION PHASING. REFER TO PHASE 1 POWER RISER DIAGRAM ON DRAWING E-7. COORDINATE WITH OWNER FOR AVAILABLE LOCATIONS TO PLACE TEMPORARY GENSET.
3. PROVIDE NEW RECEPTACLE AT ENTRY DESK IN LOBBY.
4. MOUNT NEW PANEL MDB ON STEEL CHANNELS AT CONCRETE PAD. PROVIDE KINDORF STEEL CHANNELS TO SECURE PANELBOARD TO. KINDORF CHANNELS SHALL BE BOLTED TO CONCRETE EQUIPMENT PAD.
5. EXTEND EX CONCRETE PAD FOR NEW PNL MDB AND NEW 225 KVA XFMR. NEW HOUSEKEEPING PAD SHALL BE SAME HEIGHT (MINIMUM OF 4-INCHES) AS EX PAD.
6. PROVIDE JUNCTION BOX FOR EXTENSION OF EX INCOMING FEEDER TO NEW PANEL MDB.
7. PILOT ROOM WILL BE CONVERTED TO A SOLIDS TESTING LAB BY ARLINGTON COUNTY IN THE FUTURE. WHEN THE MODIFICATION TAKES PLACE, THE SPACE WILL BE CONSIDERED A CLASS I DIVISION 2 HAZARDOUS LOCATION. ARLINGTON COUNTY WILL BE FULLY RESPONSIBLE FOR CONVERTING ALL COMPONENTS OF THE SPACE TO MEET THE STRINGENT REQUIREMENTS FOR THE HAZARDOUS LOCATION.
8. PROVIDE PANELBOARD WITH ENCLOSURE RATED FOR HAZARDOUS LOCATION THAT MEETS THE REQUIREMENTS FOR A CLASS I DIVISION 2 LOCATION AND COMPLIES WITH NEC 501.115(B).
9. PROVIDE TRANSFORMER WITH ENCLOSURE RATED FOR USE IN A HAZARDOUS LOCATION THAT MEETS THE REQUIREMENTS FOR A CLASS I DIVISION 2 LOCATION AND COMPLIES WITH NEC 501.100(B).
10. AT EXISTING DUCTWORK AND PIPING LOCATED ABOVE PANEL AND TRANSFORMER LOCATION, PROVIDE LEAK PROTECTION SYSTEM. EXISTING DUCTWORK AND PIPING FALLS WITHIN THE SIX FEET OF DEDICATED ELECTRICAL SPACE ABOVE THE ELECTRICAL EQUIPMENT THAT IS REQUIRED PER NEC 110.26(E)(1). WHEN SPACE IS MODIFIED TO SOLIDS TESTING LAB, CONSIDER RELOCATION AND/OR REMOVAL OF EXISTING DUCTWORK AND PIPING.
11. PROVIDE CONDUIT SEALS FOR CONNECTIONS THAT OCCUR AT ENCLOSURES THAT ARE RATED FOR THE HAZARDOUS CLASS I DIVISION 2 LOCATION. CONDUIT SEALS SHALL BE INSTALLED IN COMPLIANCE WITH NEC 501.15(B)(1).

GRAPHIC SCALE
0 2' 4' 8'
SCALE: 1/4" = 1'-0"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| CHIEF WATER, SEWER STREETS BUREAU | |
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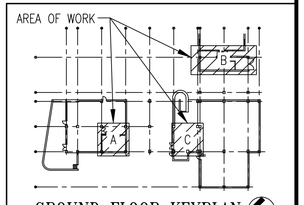
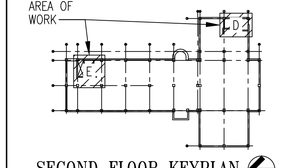
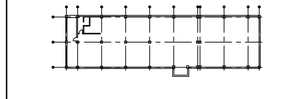



GROUND FLOOR KEYPLAN




SECOND FLOOR KEYPLAN




THIRD FLOOR KEYPLAN

Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

ELECTRICAL ENLARGED PLANS - NEW WORK

Designed: IHK
Drawn: AGT
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Date: AUGUST 7, 2023

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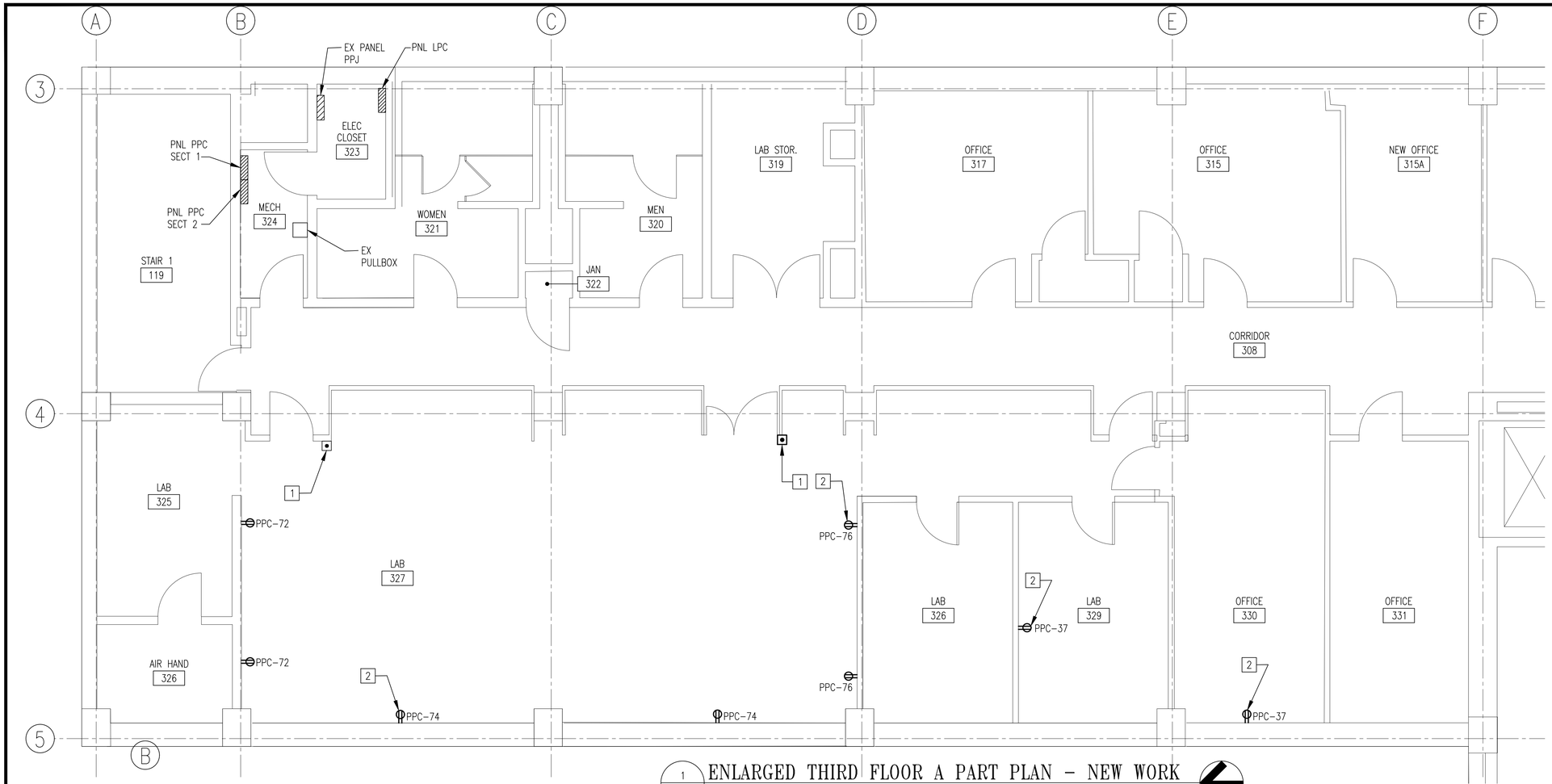
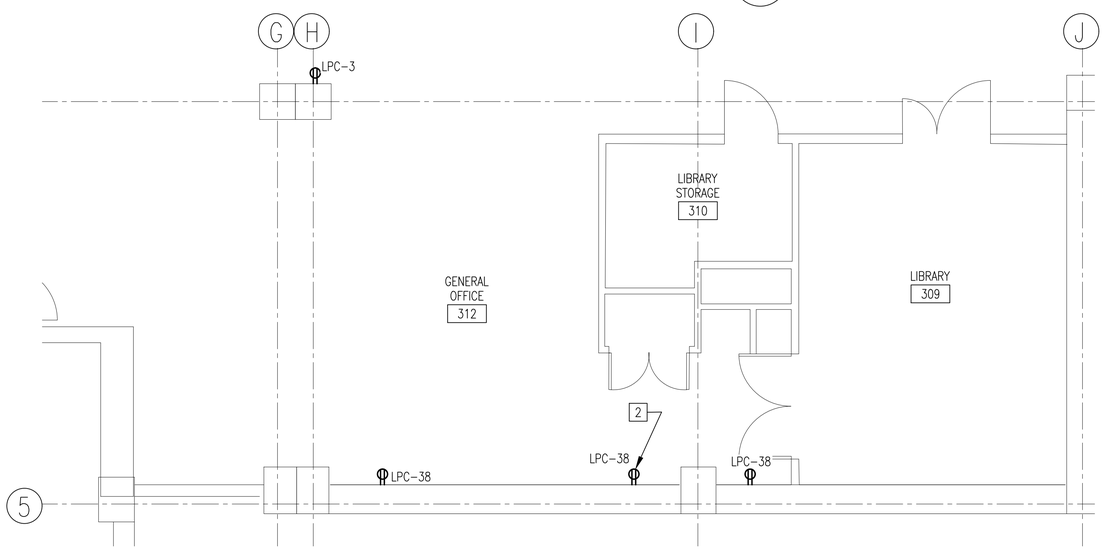
E-3




1 E-3 ENLARGED THIRD FLOOR A PART PLAN - NEW WORK

SCALE: 1/4" = 1'-0"




2 E-3 ENLARGED THIRD FLOOR B PART PLAN - NEW WORK

SCALE: 1/4" = 1'-0"

## GENERAL NOTES

1. REFER TO DRAWING G-1 FOR ELECTRICAL GENERAL NOTES, SYMBOLS, LEGEND AND ABBREVIATIONS.
2. REFER TO DRAWING G-2 FOR PHASING OF ELECTRICAL DISTRIBUTION SYSTEM REPLACEMENT.
3. REFER TO DRAWINGS E-6 THRU E-10 FOR PHASING RISER DIAGRAMS.
4. REFER TO DRAWINGS E-11 THRU E-16 FOR PANELBOARD SCHEDULES.

## SPECIFIC NOTES

1. CONNECT EX PUSHBUTTON AT LAB TO NEW SHUNT TRIP MAIN CIRCUIT BREAKER AT NEW PANEL PPC TO ALLOW FOR DISCONNECTION OF PANEL PPC MAIN CIRCUIT BREAKER UPON OPERATION OF PUSHBUTTON.
2. PROVIDE NEW RECEPTACLE IN LOCATIONS SHOWN (TYPICAL).

GRAPHIC SCALE

0 2' 4' 8'

SCALE: 1/4" = 1'-0"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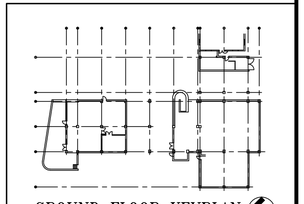
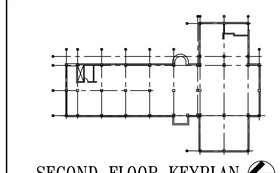
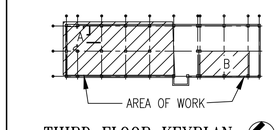


GROUND FLOOR KEYPLAN



SECOND FLOOR KEYPLAN




THIRD FLOOR KEYPLAN

Project Name and Location

ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

ELECTRICAL THIRD FLOOR PLANS - NEW WORK

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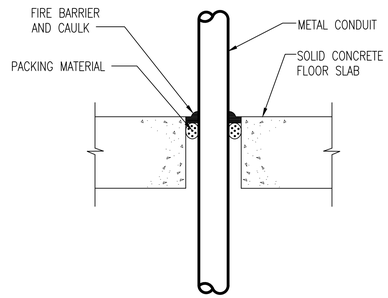
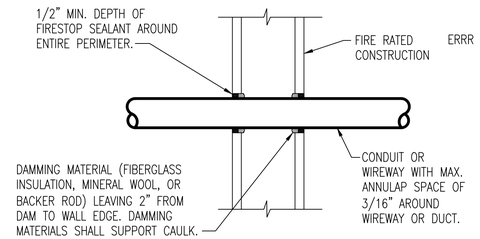
E-4




## 1 / E-4 PENETRATION FIRESTOP FOR CONDUIT THROUGH CONCRETE FLOOR

SCALE: NOT TO SCALE




## 2 / E-4 DETAIL FIRESTOP THROUGH WALL

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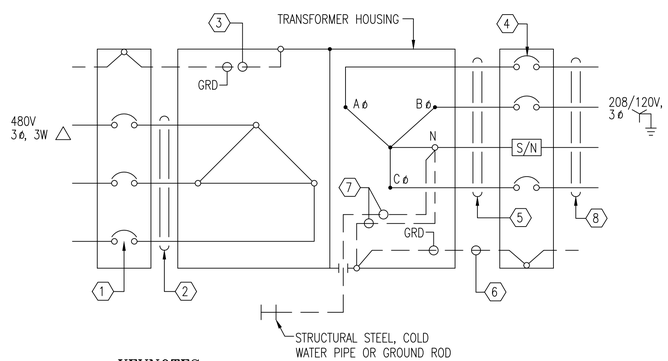


### KEYNOTES:

1. PRIMARY CIRCUIT BREAKER NOT TO EXCEED 250% PRIMARY FLA. FOR BEST RESULTS USE 125% TO AVOID UNNECESSARY TRIPPLING DUE TO INRUSH. INRUSH CURRENT WILL APPROXIMATE 12 x FLA FOR .1 SEC.
2. PRIMARY CONDUCTORS, SIZE PER PRIMARY CIRCUIT BREAKER.
3. PRIMARY GROUND, SIZE PER PRIMARY CIRCUIT BREAKER AND NEC 250, TABLE 250-122.
4. SECONDARY CIRCUIT BREAKER NOT TO EXCEED 125% OF SECONDARY FLA.
5. SECONDARY CONDUCTORS; SIZE PER SECONDARY CIRCUIT BREAKER. MUST NOT BE LESS THAN 1/3 PRIMARY CIRCUIT BREAKER RATING TIMES THE RATIO OF 480/208. NOT MORE THAN 25 FOOT LONG PER NEC 240-20.
6. WHERE THE FIRST DISCONNECTING MEANS AT THE SECONDARY SIDE OF THE TRANSFORMER AND THE TRANSFORMER ARE LOCATED IN SEPARATE ENCLOSURES. A SUPPLY SIDE BONDING CONDUCTOR MUST BE RUN WITH THE SECONDARY CONDUCTORS. THE SUPPLY SIDE BONDING JUMPER MUST BE SIZED IN COMPLIANCE WITH THE NEC 250.102(C).
7. THE CONDUCTOR THAT MUST BE GROUNDED IS THE GROUND WIRE FROM THE SECONDARY NEUTRAL TO A GROUNDING NEAR THE XFMR LOCATION. SEE NEC 250-26. THE SIZE IS BASED ON NEC TABLE 250-66. THE BONDING JUMPER CONNECTED BETWEEN THE SECONDARY NEUTRAL AND THE TRANSFORMER HOUSING MUST BE INSTALLED IN ACCORDANCE WITH NEC 250.30(A)(1) AND SIZED PER NEC 250.28(D). REFER TO GROUNDING RISER DIAGRAMS ON SHEET E-XX.
8. SECONDARY CONDUCTORS, SIZE PER SECONDARY CIRCUIT BREAKER.

## 3 / E-4 DRY TYPE TRANSFORMER WIRING

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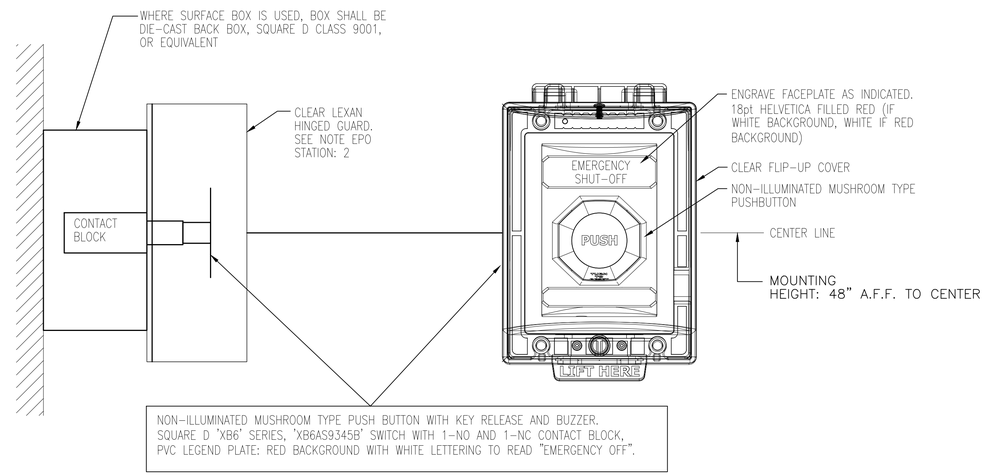


### GENERAL NOTES:

1. EMERGENCY POWER OFF (EPO) SYSTEM SHALL BE PROVIDED WITH EPO SWITCHES.
2. EPO CONTROL PANEL POWER SHALL BE 120 VAC PROVIDED FROM THE 208/120 VOLT PANEL IN RESPECTIVE ROOM.
3. MECHANICALLY HELD CONTACTOR WITH 120V COIL. RELAYS SHALL BE SQUARE-D CLASS 8501 TYPE X SERIES, OR EQUAL R400: 120 VAC, 10 AMP, CONTACT RATING. PROVIDE CONTACTS AS NECESSARY.
4. PUSHBUTTONS, SWITCHES, AND OTHER WIRING DEVICES SHALL BE INDUSTRIAL GRADE.

### EPO SWITCH NOTES:

EPO SWITCHES SHALL CONSIST OF THE FOLLOWING COMPONENTS:

1. RED PUSH BUTTON WITH NORMALLY OPENED CONTACTS, SQUARE-D CLASS 9001 TYPE K SERIES. THE PUSH BUTTON SHALL LOCK IN THE DEPRESSED POSITION. THE PUSH BUTTON SHALL BE RELEASED TO ITS NORMAL STATE BY MEANS OF A KEY RELEASE MECHANISM.
2. HINGED COVER GUARD WITH AUDIBLE COVER ACTIVATION HORN TO PROTECT PUSH BUTTON STATION FROM ACCIDENTAL OPERATION. MANUFACTURED BY: SAFETY TECHNOLOGY INCORPORATED, 2306 AIRPORT RD., WATERFORD, MICHIGAN 48327-1209. PHONE: 248-673-9898. PROVIDE "EMERGENCY SHUT OFF" LABEL UNDER COVER.

## 4 / E-4 EPO SWITCH

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| CHIEF WATER, SEWER STREETS BUREAU | |
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Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

ELECTRICAL DETAILS

Designed: IHK
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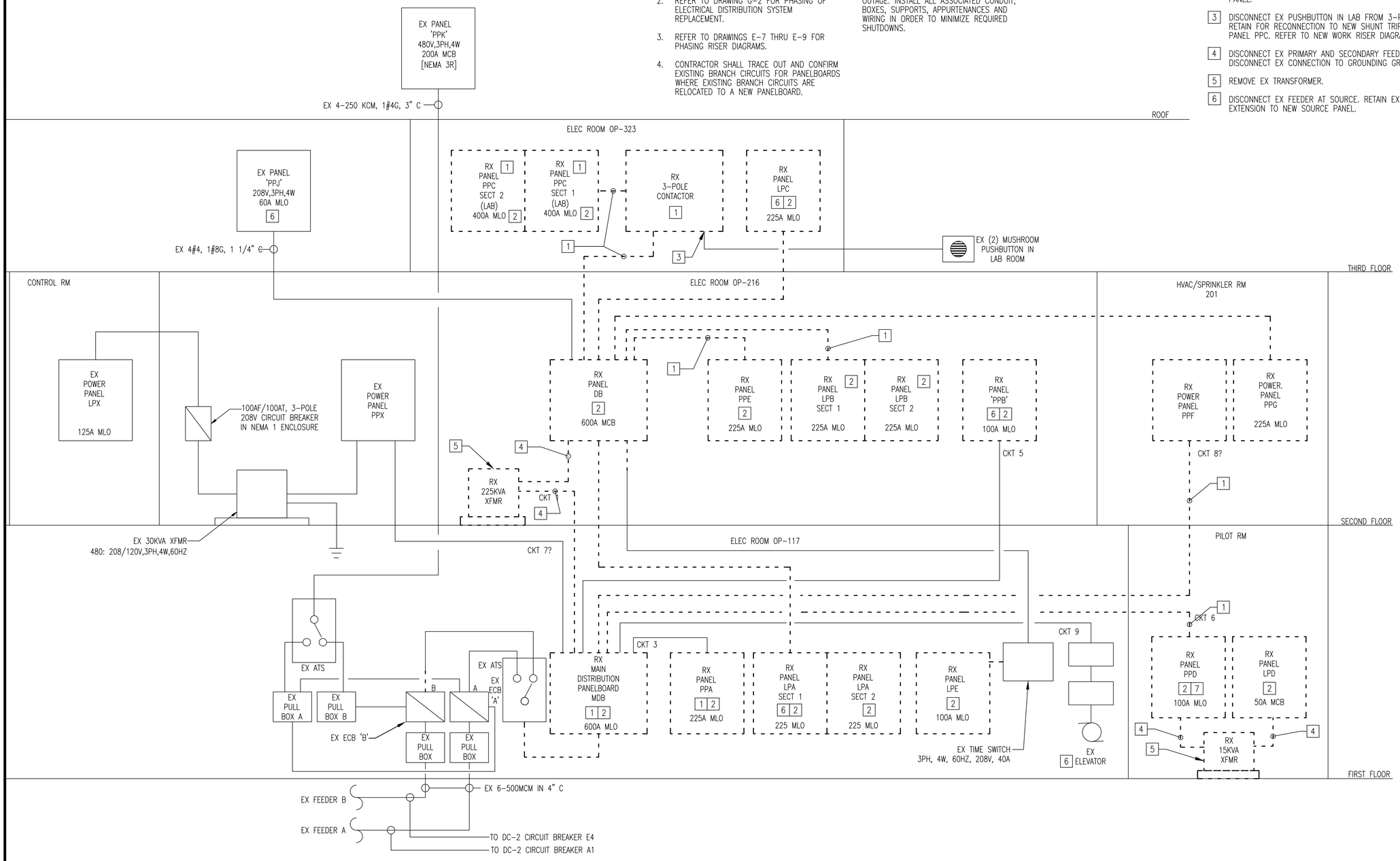
Sheet
E-5

## GENERAL NOTES

1. REFER TO DRAWING G-1 FOR ELECTRICAL GENERAL NOTES, SYMBOLS, LEGEND AND ABBREVIATIONS.
2. REFER TO DRAWING G-2 FOR PHASING OF ELECTRICAL DISTRIBUTION SYSTEM REPLACEMENT.
3. REFER TO DRAWINGS E-7 THRU E-9 FOR PHASING RISER DIAGRAMS.
4. CONTRACTOR SHALL TRACE OUT AND CONFIRM EXISTING BRANCH CIRCUITS FOR PANELBOARDS WHERE EXISTING BRANCH CIRCUITS ARE RELOCATED TO A NEW PANELBOARD.
5. PRIOR TO SHUTDOWNS FOR SWITCHING OVER OF POWER SOURCES FOR NEW AND EXISTING PANELBOARDS, ROUTE FEEDER CONDUIT AND CONDUCTORS TO MINIMIZE THE LENGTH OF THE OUTAGE. INSTALL ALL ASSOCIATED CONDUIT, BOXES, SUPPORTS, APPURTENANCES AND WIRING IN ORDER TO MINIMIZE REQUIRED SHUTDOWNS.

## SPECIFIC NOTES

1. DISCONNECT EX FEEDER AND REMOVE BACK TO SOURCE.
2. DISCONNECT EX BRANCH CIRCUITS AND RETAIN TO EXTEND TO NEW PANEL.
3. DISCONNECT EX PUSHBUTTON IN LAB FROM 3-POLE CONTACTOR. RETAIN FOR RECONNECTION TO NEW SHUNT TRIP CIRCUIT BREAKER AT PANEL PPC. REFER TO NEW WORK RISER DIAGRAM.
4. DISCONNECT EX PRIMARY AND SECONDARY FEEDER AT XFMR. DISCONNECT EX CONNECTION TO GROUNDING GRID AT XFMR.
5. REMOVE EX TRANSFORMER.
6. DISCONNECT EX FEEDER AT SOURCE. RETAIN EX FEEDER FOR EXTENSION TO NEW SOURCE PANEL.




1 / E-5 OPERATIONS CONTROL BUILDING POWER RISER DIAGRAM - DEMOLITION

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Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

OPERATIONS CONTROL BUILDING POWER RISER DIAGRAM - DEMOLITION

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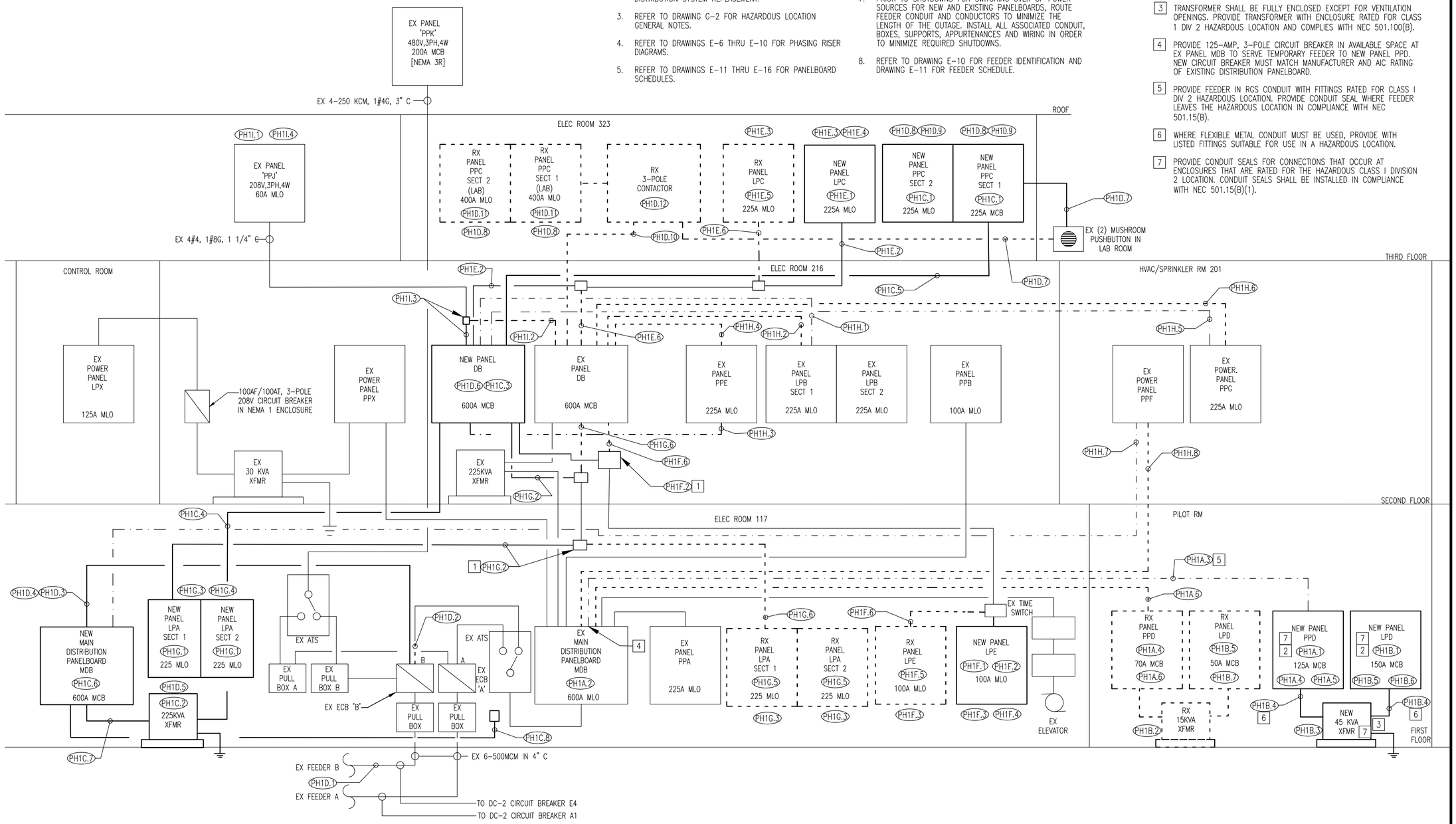
Sheet
E-6

## GENERAL NOTES

1. REFER TO DRAWING G-1 FOR ELECTRICAL GENERAL NOTES, SYMBOLS, LEGEND AND ABBREVIATIONS.
2. REFER TO DRAWING G-2 FOR PHASING OF ELECTRICAL DISTRIBUTION SYSTEM REPLACEMENT.
3. REFER TO DRAWING G-2 FOR HAZARDOUS LOCATION GENERAL NOTES.
4. REFER TO DRAWINGS E-6 THRU E-10 FOR PHASING RISER DIAGRAMS.
5. REFER TO DRAWINGS E-11 THRU E-16 FOR PANELBOARD SCHEDULES.
6. CONTRACTOR SHALL TRACE OUT AND CONFIRM EXISTING BRANCH CIRCUITS FOR PANELBOARDS WHERE EXISTING BRANCH CIRCUITS ARE RELOCATED TO A NEW PANELBOARD.
7. PRIOR TO SHUTDOWNS FOR SWITCHING OVER OF POWER SOURCES FOR NEW AND EXISTING PANELBOARDS, ROUTE FEEDER CONDUIT AND CONDUCTORS TO MINIMIZE THE LENGTH OF THE OUTAGE. INSTALL ALL ASSOCIATED CONDUIT, BOXES, SUPPORTS, APPURTENANCES AND WIRING IN ORDER TO MINIMIZE REQUIRED SHUTDOWNS.
8. REFER TO DRAWING E-10 FOR FEEDER IDENTIFICATION AND DRAWING E-11 FOR FEEDER SCHEDULE.

## SPECIFIC NOTES

1. PROVIDE PULLBOX AND EXTEND EX FEEDER AS INDICATED.
2. PROVIDE PANELBOARD WITH ENCLOSURE RATED FOR USE IN CLASS 1 DIVISION 1 HAZARDOUS LOCATION.
3. TRANSFORMER SHALL BE FULLY ENCLOSED EXCEPT FOR VENTILATION OPENINGS. PROVIDE TRANSFORMER WITH ENCLOSURE RATED FOR CLASS 1 DIV 2 HAZARDOUS LOCATION AND COMPLIES WITH NEC 501.100(B).
4. PROVIDE 125-AMP, 3-POLE CIRCUIT BREAKER IN AVAILABLE SPACE AT EX PANEL MDB TO SERVE TEMPORARY FEEDER TO NEW PANEL PPD. NEW CIRCUIT BREAKER MUST MATCH MANUFACTURER AND AIC RATING OF EXISTING DISTRIBUTION PANELBOARD.
5. PROVIDE FEEDER IN RGS CONDUIT WITH FITTINGS RATED FOR CLASS I DIV 2 HAZARDOUS LOCATION. PROVIDE CONDUIT SEAL WHERE FEEDER LEAVES THE HAZARDOUS LOCATION IN COMPLIANCE WITH NEC 501.15(B).
6. WHERE FLEXIBLE METAL CONDUIT MUST BE USED, PROVIDE WITH LISTED FITTINGS SUITABLE FOR USE IN A HAZARDOUS LOCATION.
7. PROVIDE CONDUIT SEALS FOR CONNECTIONS THAT OCCUR AT ENCLOSURES THAT ARE RATED FOR THE HAZARDOUS CLASS I DIVISION 2 LOCATION. CONDUIT SEALS SHALL BE INSTALLED IN COMPLIANCE WITH NEC 501.15(B)(1).




1 / E-6 OPERATIONS CONTROL BUILDING POWER RISER DIAGRAM - PHASE 1

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| DEPARTMENT OF TRANSPORTATION | |

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Project Name and Location

ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

OPERATIONS CONTROL BUILDING POWER RISER DIAGRAM - PHASE 1

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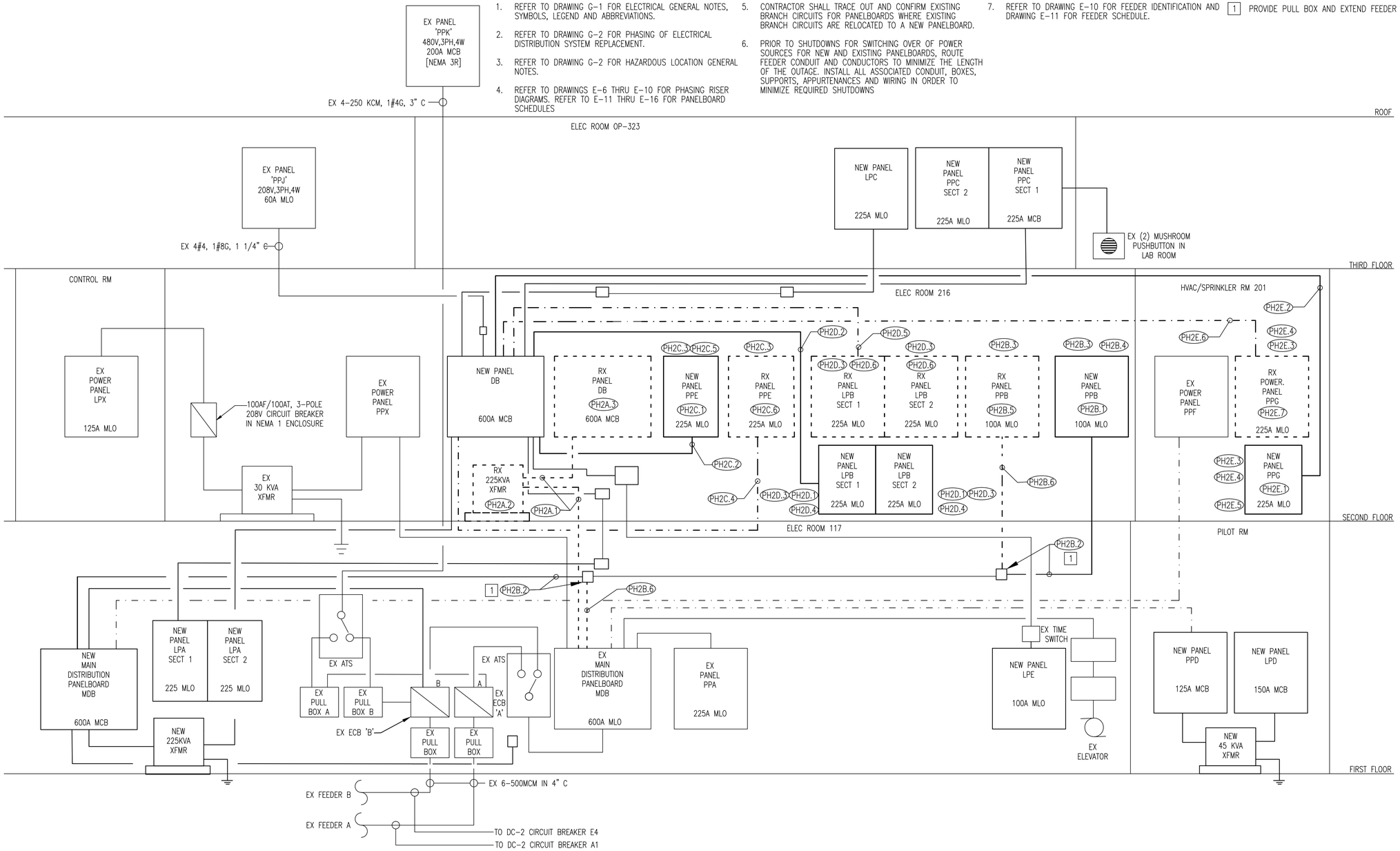
Sheet E-7

## GENERAL NOTES

1. REFER TO DRAWING G-1 FOR ELECTRICAL GENERAL NOTES, SYMBOLS, LEGEND AND ABBREVIATIONS.
2. REFER TO DRAWING G-2 FOR PHASING OF ELECTRICAL DISTRIBUTION SYSTEM REPLACEMENT.
3. REFER TO DRAWING G-2 FOR HAZARDOUS LOCATION GENERAL NOTES.
4. REFER TO DRAWINGS E-6 THRU E-10 FOR PHASING RISER DIAGRAMS. REFER TO E-11 THRU E-16 FOR PANELBOARD SCHEDULES
5. CONTRACTOR SHALL TRACE OUT AND CONFIRM EXISTING BRANCH CIRCUITS FOR PANELBOARDS WHERE EXISTING BRANCH CIRCUITS ARE RELOCATED TO A NEW PANELBOARD.
6. PRIOR TO SHUTDOWNS FOR SWITCHING OVER OF POWER SOURCES FOR NEW AND EXISTING PANELBOARDS, ROUTE FEEDER CONDUIT AND CONDUCTORS TO MINIMIZE THE LENGTH OF THE OUTAGE. INSTALL ALL ASSOCIATED CONDUIT, BOXES, SUPPORTS, APPURTENANCES AND WIRING IN ORDER TO MINIMIZE REQUIRED SHUTDOWNS
7. REFER TO DRAWING E-10 FOR FEEDER IDENTIFICATION AND DRAWING E-11 FOR FEEDER SCHEDULE.

## SPECIFIC NOTES

1 PROVIDE PULL BOX AND EXTEND FEEDER AS INDICATED




1 / E-7 OPERATIONS CONTROL BUILDING POWER RISER DIAGRAM - PHASE 2

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Project Name and Location

ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

OPERATIONS CONTROL BUILDING POWER RISER DIAGRAM - PHASE 2

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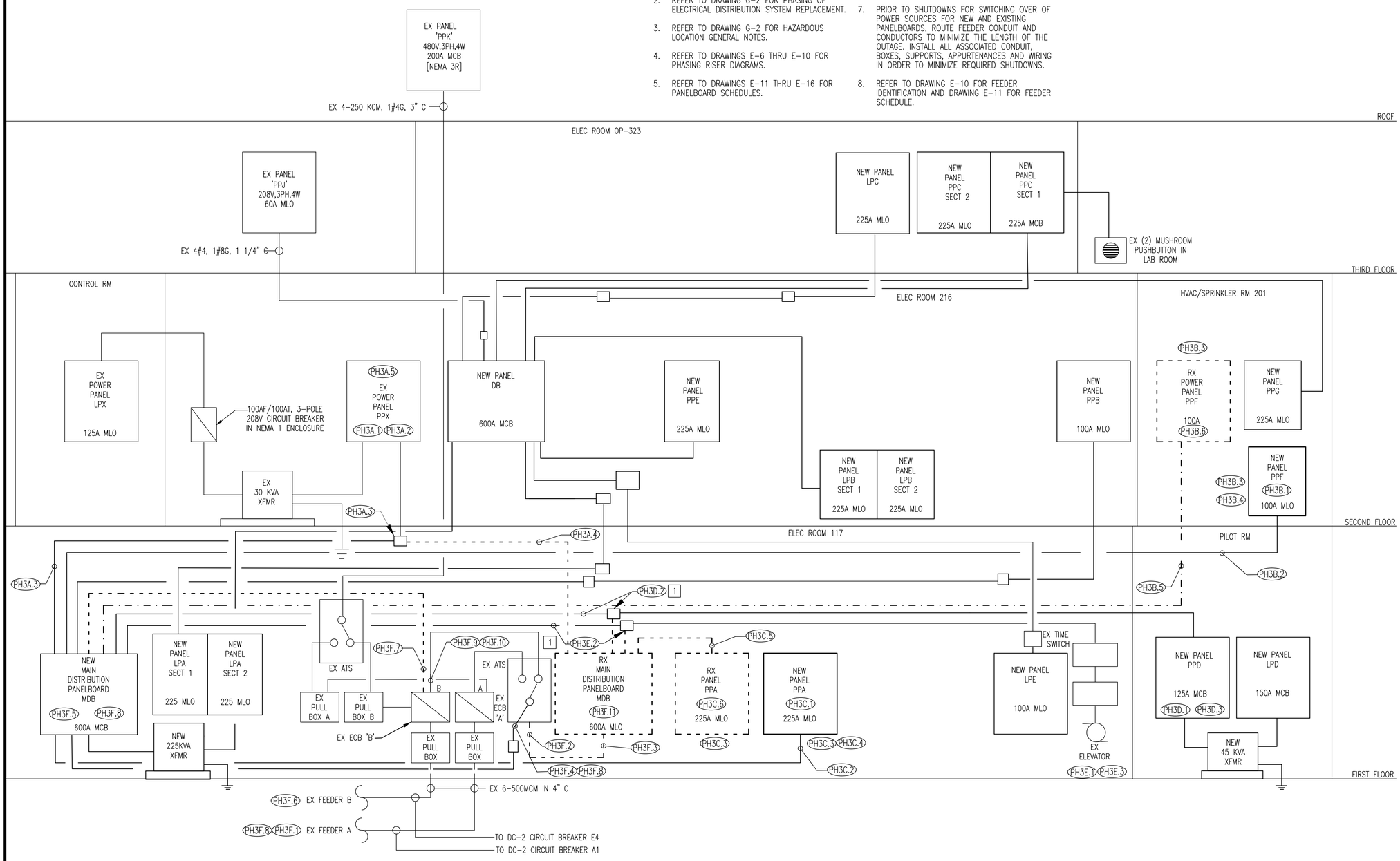
Sheet E-8

## GENERAL NOTES

1. REFER TO DRAWING G-1 FOR ELECTRICAL GENERAL NOTES, SYMBOLS, LEGEND AND ABBREVIATIONS.
2. REFER TO DRAWING G-2 FOR PHASING OF ELECTRICAL DISTRIBUTION SYSTEM REPLACEMENT.
3. REFER TO DRAWING G-2 FOR HAZARDOUS LOCATION GENERAL NOTES.
4. REFER TO DRAWINGS E-6 THRU E-10 FOR PHASING RISER DIAGRAMS.
5. REFER TO DRAWINGS E-11 THRU E-16 FOR PANELBOARD SCHEDULES.
6. CONTRACTOR SHALL TRACE OUT AND CONFIRM EXISTING BRANCH CIRCUITS FOR PANELBOARDS WHERE EXISTING BRANCH CIRCUITS ARE RELOCATED TO A NEW PANELBOARD.
7. PRIOR TO SHUTDOWNS FOR SWITCHING OVER OF POWER SOURCES FOR NEW AND EXISTING PANELBOARDS, ROUTE FEEDER CONDUIT AND CONDUCTORS TO MINIMIZE THE LENGTH OF THE OUTAGE. INSTALL ALL ASSOCIATED CONDUIT, BOXES, SUPPORTS, APPURTENANCES AND WIRING IN ORDER TO MINIMIZE REQUIRED SHUTDOWNS.
8. REFER TO DRAWING E-10 FOR FEEDER IDENTIFICATION AND DRAWING E-11 FOR FEEDER SCHEDULE.

## SPECIFIC NOTES

1 PROVIDE PULL BOX AND EXTEND FEEDER AS INDICATED.




1 / E-8 OPERATIONS CONTROL BUILDING POWER RISER DIAGRAM - PHASE 3

SCALE: NOT TO SCALE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| DESIGN TEAM SUPERVISOR | |
| CHIEF ENGINEERING BUREAU | |
| CHIEF WATER, SEWER STREETS BUREAU | |
| DEPARTMENT OF TRANSPORTATION | |

| Revisions | Date |
|---|---|
| | |

Project Name and Location

ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

OPERATIONS CONTROL BUILDING POWER RISER DIAGRAM - PHASE 3

Designed: IHK
Drawn: AGT
Checked: IHK
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Scale: NTS

Date: AUGUST 7, 2023

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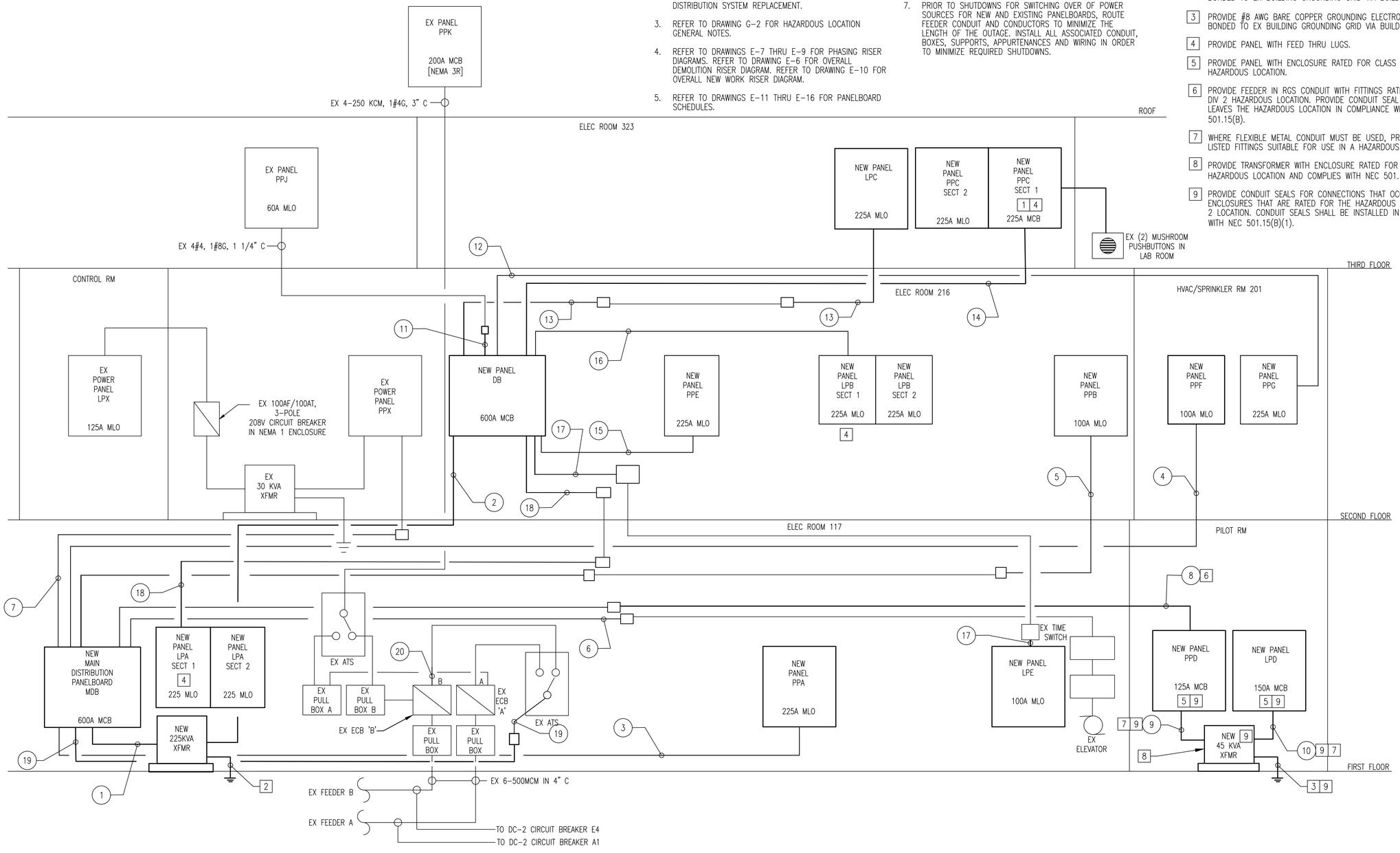
Sheet E-9

## GENERAL NOTES

1. REFER TO DRAWING G-1 FOR ELECTRICAL GENERAL NOTES, SYMBOLS, LEGEND AND ABBREVIATIONS.
2. REFER TO DRAWING G-2 FOR PHASING OF ELECTRICAL DISTRIBUTION SYSTEM REPLACEMENT.
3. REFER TO DRAWING G-2 FOR HAZARDOUS LOCATION GENERAL NOTES.
4. REFER TO DRAWINGS E-7 THRU E-9 FOR PHASING RISER DIAGRAMS. REFER TO DRAWING E-6 FOR OVERALL DEMOLITION RISER DIAGRAM. REFER TO DRAWING E-10 FOR OVERALL NEW WORK RISER DIAGRAM.
5. REFER TO DRAWINGS E-11 THRU E-16 FOR PANELBOARD SCHEDULES.
6. CONTRACTOR SHALL TRACE OUT AND CONFIRM EXISTING BRANCH CIRCUITS FOR PANELBOARDS WHERE EXISTING BRANCH CIRCUITS ARE RELOCATED TO A NEW PANELBOARD.
7. PRIOR TO SHUTDOWNS FOR SWITCHING OVER OF POWER SOURCES FOR NEW AND EXISTING PANELBOARDS, ROUTE FEEDER CONDUIT AND CONDUCTORS TO MINIMIZE THE LENGTH OF THE OUTAGE. INSTALL ALL ASSOCIATED CONDUIT, BOXES, SUPPORTS, APPURTENANCES AND WIRING IN ORDER TO MINIMIZE REQUIRED SHUTDOWNS.

## SPECIFIC NOTES

1. PROVIDE PANEL WITH SHUNT TRIP MAIN CIRCUIT BREAKER.
2. PROVIDE 2/0 AWG BARE COPPER GROUNDING ELECTRODE CONDUCTOR BONDED TO EX BUILDING GROUNDING GRID VIA BUILDING STEEL.
3. PROVIDE #8 AWG BARE COPPER GROUNDING ELECTRODE CONDUCTOR BONDED TO EX BUILDING GROUNDING GRID VIA BUILDING STEEL.
4. PROVIDE PANEL WITH FEED THRU LUGS.
5. PROVIDE PANEL WITH ENCLOSURE RATED FOR CLASS 1 DIV 1 HAZARDOUS LOCATION.
6. PROVIDE FEEDER IN RGS CONDUIT WITH FITTINGS RATED FOR CLASS I DIV 2 HAZARDOUS LOCATION. PROVIDE CONDUIT SEAL WHERE FEEDER LEAVES THE HAZARDOUS LOCATION IN COMPLIANCE WITH NEC 501.15(B).
7. WHERE FLEXIBLE METAL CONDUIT MUST BE USED, PROVIDE WITH LISTED FITTINGS SUITABLE FOR USE IN A HAZARDOUS LOCATION.
8. PROVIDE TRANSFORMER WITH ENCLOSURE RATED FOR CLASS 1 DIV 2 HAZARDOUS LOCATION AND COMPLIES WITH NEC 501.100(B).
9. PROVIDE CONDUIT SEALS FOR CONNECTIONS THAT OCCUR AT ENCLOSURES THAT ARE RATED FOR THE HAZARDOUS CLASS I DIVISION 2 LOCATION. CONDUIT SEALS SHALL BE INSTALLED IN COMPLIANCE WITH NEC 501.15(B)(1).




1 / E-9 OPERATIONS CONTROL BUILDING POWER RISER DIAGRAM - FINAL
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| Approvals | Date |
|---|---|
| DESIGN TEAM SUPERVISOR | |
| CHIEF ENGINEERING BUREAU | |
| CHIEF WATER, SEWER STREETS BUREAU | |
| DEPARTMENT OF TRANSPORTATION | |

| Revisions | Date |
|---|---|
| | |

Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

OPERATIONS CONTROL BUILDING POWER RISER DIAGRAM - FINAL

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Scale: NTS

Date: AUGUST 7, 2023

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Sheet
E-10

# FEEDER SCHEDULE

| FEEDER | CONDUIT | | CABLE | | | FROM | TO | REMARKS |
|---|---|---|---|---|---|---|---|---|
| NO. | SIZE | TYPE | QUANTITY | SIZE | GROUND | | | |
| 1 | 4" | RGS | (4) | 400 KCMIL | #3 | PNL MDB | 225 KVA XFMR | |
| 2 | (2) 3" | RGS | 2 SETS | (4) 350 KCMIL | 2/0 | 225 KVA XFMR | PANEL DB | |
| 3 | 2" | RGS | (4) | 3/0 | #6 | PNL MDB | PNL PPA | |
| 4 | 2" | RGS | (4) | 1/0 | #6 | PNL MDB | PNL PPF | |
| 5 | 1 1/2" | EMT | (4) | #4 | #8 | PNL MDB | PNL PPB | |
| 6 | 1" | RGS | (4) | #6 | #10 | PNL MDB | ELEVATOR | |
| 7 | 2" | RGS | (4) | 1/0 | #6 | PNL MDB | PNL PPX | |
| 8 | 2" | RGS | (4) | 1/0 | #6 | PNL MDB | PNL PPD | NOTE 1 |
| 9 | 1" | FMC/RGS | (3) | #4 | #8 | PANEL PPD | 45 KVA XFMR | NOTE 1 & 2 |
| 10 | 2" | FMC/RGS | (4) | 1/0 | #6 | 45 KVA XFMR | PNL LPD | NOTE 1 & 2 |
| 11 | 1 1/4" | EMT | (4) | #4 | #8 | PNL DB | PNL PPJ | |
| 12 | 2" | RGS | (4) | 1/0 | #6 | PNL DB | PNL PPG | |
| 13 | 2" | RGS | (4) | 1/0 | #6 | PNL DB | PNL LPC | |
| 14 | 3" | RGS | (4) | 250 KCMIL | #4 | PNL DB | PNL PPC | |
| 15 | 1" | EMT | (4) | #6 | #10 | PNL DB | PNL PPE | |
| 16 | 2" | RGS | (4) | 1/0 | #6 | PNL DB | PNL LPB | |
| 17 | 1" | EMT | (4) | #10 | #10 | PNL DB | PNL LPE | |
| 18 | 2" | RGS | (4) | 1/0 | #6 | PNL DB | PNL LPA | |
| 19 | (2) 4" | RGS | 2 SETS | (4) 600 KCMIL | #1 | EX ATS | PANEL MDB | |
| 20 | (2) 4" | RGS | 2 SETS | (4) 600 KCMIL | #1 | EX ECB 'B' | EX ATS | |

NOTE 1: PROVIDE FEEDER IN RGS CONDUIT WITH FITTINGS RATED FOR CLASS I DIVISION 2 HAZARDOUS LOCATION. PROVIDE CONDUIT SEAL WHERE FEEDER LEAVES THE HAZARDOUS LOCATION IN COMPLIANCE WITH NEC 501.15(B).

NOTE 2: WHERE FLEXIBLE METAL CONDUIT MUST BE USED, PROVIDE WITH LISTED FITTINGS SUITABLE FOR USE IN A HAZARDOUS LOCATION.

## NEW PANEL MDB

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 480/277 | PH-GRD VOLTAGE: | 277 | ACCESSORIES: | SERVICE ENTRANCE |
| MCB OR MLO: | MCB | PHASE: | 3 | PH-PH VOLTAGE: | 480 | ACCESSORIES: | DOOR-IN-DOOR |
| MCB FRAME SIZE: | 600 | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | DC-A1 & DC-E4 | ACCESSORIES: | - |
| MCB TRIP AMPS: | 600 | BUS RATING: | 600 | SOURCE LOCATION: | INCOMING FEEDERS | ACCESSORIES: | - |
| MCB MAX KVA RATING: | 399 | KAIC: | 35 | PANEL LOCATION: | ELEC RM RM 117 | ACCESSORIES: | - |
| SPARE KVA: | 399 | SPARE PERCENT: | 100% | | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 225 KVA XFMR/PNL DB | 4" | RGS | (4) 4OO KCMIL | #3 | THWN | 35 | 350 | 1 | 0.0 | 0.0 | 2 | | | | | | | | SPACE |
| | | | | | | | | 3 | | | 4 | | | | | | | | |
| | | | | | | | | 5 | | | 6 | | | | | | | | |
| PNL PPA | 2" | RGS | (4) 3/0 | #6 | THWN | 35 | 200 | 7 | 0.0 | 0.0 | 8 | 100 | 35 | THWN | #6 | (4) 1/0 | RGS | 2" | SPARE/TEMP FEED TO EX PNL PPF |
| | | | | | | | | 9 | | | 10 | | | | | | | | |
| | | | | | | | | 11 | | | 12 | | | | | | | | |
| PNL PPF | 2" | RGS | (4) 1/0 | #6 | THWN | 35 | 100 | 13 | 0.0 | 0.0 | 14 | 100 | 35 | THWN | #6 | (4) 1/0 | RGS | 2" | PNL PPX |
| | | | | | | | | 15 | | | 16 | | | | | | | | |
| | | | | | | | | 17 | | | 18 | | | | | | | | |
| PNL PPB | 2" | RGS | (4) 1/0 | #6 | THWN | 35 | 70 | 19 | 0.0 | 0.0 | 20 | 70 | 35 | THWN | #8 | (4) #4 | EMT | 1" | PNL PPD |
| | | | | | | | | 21 | | | 22 | | | | | | | | |
| | | | | | | | | 23 | | | 24 | | | | | | | | |
| ELEVATOR | 1" | RGS | (4) #6 | #10 | THWN | 35 | 50 | 25 | 0.0 | 0.0 | 26 | 50 | 35 | | | | | | SPARE |
| | | | | | | | | 27 | | | 28 | | | | | | | | |
| | | | | | | | | 29 | | | 30 | | | | | | | | |
| SPACE | | | | | | | | 31 | 0.0 | 0.0 | 32 | | | | | | | | SPACE |
| | | | | | | | | 33 | | | 34 | | | | | | | | |
| | | | | | | | | 35 | | | 36 | | | | | | | | |
| SPACE | | | | | | | | 37 | 0.0 | 0.0 | 38 | | | | | | | | SPACE |
| | | | | | | | | 39 | | | 40 | | | | | | | | |
| | | | | | | | | 41 | | | 42 | | | | | | | | |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| - | - | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | - | - |
| - | - | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | - | - |
| - | - | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | - | - |

## NEW PANEL DB

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 | ACCESSORIES: | DOOR-IN-DOOR |
| MCB OR MLO: | MCB | PHASE: | 3 | PH-PH VOLTAGE: | 208 | ACCESSORIES: | - |
| MCB FRAME SIZE: | 600 | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | 225 KVA XFMR/MDB | ACCESSORIES: | - |
| MCB TRIP AMPS: | 600 | BUS RATING: | 600 | SOURCE LOCATION: | ELEC RM 117 | ACCESSORIES: | - |
| MCB MAX KVA RATING: | 173 | KAIC: | 18 | PANEL LOCATION: | ELEC RM 216 | ACCESSORIES: | - |
| SPARE KVA: | 134 | SPARE PERCENT: | 77% | | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EX PNL PPJ | 1 1/4" | EMT | (4) #4 | #8 | THWN | 35 | 70 | 1 | 0.0 | 0.0 | 2 | 100 | | | | | | | EX CIRCUIT |
| | | | | | | | | 3 | 0.0 | 0.0 | 4 | | | | | | | | |
| | | | | | | | | 5 | 0.0 | 0.0 | 6 | | | | | | | | SPACE |
| PNL PPG | 2" | RGS | (4) 1/0 | #6 | THWN | 35 | 90 | 7 | 46.0 | 0.0 | 8 | 125 | | | | | | | EX CIRCUIT |
| | | | | | | | | 9 | 46.0 | 0.0 | 10 | | | | | | | | |
| | | | | | | | | 11 | 46.0 | 0.0 | 12 | | | | | | | | |
| PNL LPC | 2" | RGS | (4) 1/0 | #6 | THWN | 35 | 125 | 13 | 30.5 | 16.7 | 14 | 30 | 35 | THWN | #10 | (4) #10 | EMT | 1" | PNL LPE |
| | | | | | | | | 15 | 30.5 | 16.7 | 16 | | | | | | | | |
| | | | | | | | | 17 | 30.5 | 16.7 | 18 | | | | | | | | |
| PNL PPC | 3" | RGS | (4) 250 KCMIL | #4 | THWN | 35 | 225 | 19 | 25.0 | 25.0 | 20 | 50 | 35 | THWN | #10 | (4) #6 | EMT | 1" | PNL PPE |
| | | | | | | | | 21 | 28.0 | 25.0 | 22 | | | | | | | | |
| | | | | | | | | 23 | 19.2 | 25.0 | 24 | | | | | | | | |
| SPARE/TEMP FEED TO EX PNL PPE | 1" | EMT | (4) #6 | #10 | THWN | 35 | 50 | 25 | 0.0 | 0.0 | 26 | 125 | 35 | THWN | #6 | (4) 1/0 | RGS | 2" | PNL LPB |
| | | | | | | | | 27 | 0.0 | 0.0 | 28 | | | | | | | | |
| | | | | | | | | 29 | 0.0 | 0.0 | 30 | | | | | | | | |
| SPARE/TEMP FEED TO EX PNL LPB | 2" | RGS | (4) 1/0 | #6 | THWN | 35 | 125 | 31 | 0.0 | 0.0 | 32 | 125 | 35 | THWN | #6 | (4) 1/0 | RGS | 2" | PNL LPA |
| | | | | | | | | 33 | 0.0 | 0.0 | 34 | | | | | | | | |
| | | | | | | | | 35 | 0.0 | 0.0 | 36 | | | | | | | | |
| SPARE/TEMP FEED TO EX PNL PPG | 2" | RGS | (4) 1/0 | #6 | THWN | 35 | 90 | 37 | 0.0 | 0.0 | 38 | 100 | | | | | | | SPARE |
| | | | | | | | | 39 | 0.0 | 0.0 | 40 | | | | | | | | |
| | | | | | | | | 41 | 0.0 | 0.0 | 42 | | | | | | | | |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 17.0 | 100% | 17.0 | 51.2 | 142.2 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 10.0 | 100% | 10.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 24.2 | 50% | 12.1 | 39.1 | 108.5 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 17.2 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 143.2 | A-PHASE AMPS |
| B-PHASE KVA | 17.5 | CONTINUOUS LOAD FACTOR: | | 1.25 | 61.1 | KVA | | 146.2 | B-PHASE AMPS |
| C-PHASE KVA | 16.5 | FUTURE LOAD FACTOR: | | 1.25 | 169.6 | AMPS | | 137.4 | C-PHASE AMPS |


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PROFESSIONAL ENGINEER

| Approvals | Date |
|---|---|
| DESIGN TEAM SUPERVISOR | |
| CHIEF ENGINEERING BUREAU | |
| CHIEF WATER, SEWER STREETS BUREAU | |
| DEPARTMENT OF TRANSPORTATION | |

| Revisions | Date |
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Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

ELECTRICAL SCHEDULES

Designed: IHK
Drawn: AGT
Checked: IHK
Miss Utility Transmittal #:

Filename: 90258015-E11.dwg
Path: N:\90258-015\CADD\
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Plotted by: cwolfe

Scale: NTS

Date: AUGUST 7, 2023

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Sheet
E-11

## NEW PANEL LPA SECTION 1

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 | ACCESSORIES: | DOOR-IN-DOOR |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 208 | ACCESSORIES: | FEED THRU LUGS |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL DB | ACCESSORIES: | - |
| MCB TRIP AMPS: | - | BUS RATING: | 225 | SOURCE LOCATION: | ELEC RM RM 216 | ACCESSORIES: | - |
| MCB MAX KVA RATING: | - | KAIC: | 10 | PANEL LOCATION: | ELEC RM RM 117 | ACCESSORIES: | - |
| SPARE KVA: | 81 | SPARE PERCENT: | 36% | | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LTG MECH RM | | | | | | 10 | 20 | 1 | 0.0 | 0.0 | 2 | 20 | 10 | | | | | | LTG RECEIVING |
| LTG BOILER RM | | | | | | 10 | 20 | 3 | 0.0 | 0.0 | 4 | 20 | 10 | | | | | | LTG RECEIVING |
| LTG ELEC RM, GAS CYL STR | | | | | | 10 | 20 | 5 | 0.0 | 0.0 | 6 | 20 | 10 | | | | | | LTG TOILETS |
| LTG EXHIBITION LOBBY | | | | | | 10 | 20 | 7 | 0.0 | 0.0 | 8 | 20 | 10 | | | | | | LTG ENTRY, EXHIBIT LOBBY |
| LTG EXHIBITION LOBBY | | | | | | 10 | 20 | 9 | 0.0 | 0.0 | 10 | 20 | 10 | | | | | | NIGHT LTG LOBBY, STAIRS |
| LTG EXHIBITION LOBBY | | | | | | 10 | 20 | 11 | 0.0 | 0.0 | 12 | 20 | 10 | | | | | | ELEV MACH & PIT |
| HOT WTR CIRC PUMP #1 | | | | | | 10 | 20 | 13 | 0.0 | 0.0 | 14 | 20 | 10 | | | | | | SPRINKLER VALVE, HEAT TP |
| HOT WTR CIRC PUMP #2 | | | | | | 10 | 20 | 15 | 0.0 | 0.0 | 16 | 20 | 10 | | | | | | FIRST AID UNIT |
| CUH 1/12 HP | | | | | | 10 | 20 | 17 | 0.0 | 0.0 | 18 | 20 | 10 | | | | | | LTG STAIR 1 |
| PEF 2 1/2 HP DAMPER | | | | | | 10 | 20 | 19 | 0.0 | 0.0 | 20 | 20 | 10 | | | | | | PUH-1, 2, 3 |
| PEF 3 1/6 HP DAMPER | | | | | | 10 | 20 | 21 | 0.0 | 0.0 | 22 | 20 | 10 | | | | | | LTG STAIR #3 |
| BOILER #2 BURNER PUMP | | | | | | 10 | 20 | 23 | 0.0 | 0.0 | 24 | 20 | 10 | | | | | | RECEPT LOBBY |
| BOILER #1 | | | | | | 10 | 20 | 25 | 0.0 | 0.0 | 26 | | | | | | | | SPACE |
| SPARE/TEMP FEED TO EX PNL LPD | | | | | | 10 | 50 | 27 | 0.0 | 0.0 | 28 | | | | | | | | SPACE |
| | | | | | | | | 29 | 0.0 | 0.0 | 30 | | | | | | | | SPACE |
| | | | | | | | | 31 | 0.0 | 0.0 | 32 | | | | | | | | SPACE |
| SPACE | | | | | | | | 33 | 0.0 | 0.0 | 34 | | | | | | | | SPACE |
| SPACE | | | | | | | | 35 | 0.0 | 0.0 | 36 | | | | | | | | SPACE |
| SPACE | | | | | | | | 37 | 0.0 | 0.0 | 38 | | | | | | | | SPACE |
| SPACE | | | | | | | | 39 | 0.0 | 0.0 | 40 | | | | | | | | SPACE |
| SPACE | | | | | | | | 41 | 0.0 | 0.0 | 42 | | | | | | | | SPACE |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.0 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 0.0 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | 0.0 | C-PHASE AMPS |

## NEW PANEL LPA SECTION 2

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 | ACCESSORIES: | DOOR-IN-DOOR |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 208 | ACCESSORIES: | - |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL LPA-1 | ACCESSORIES: | - |
| MCB TRIP AMPS: | - | BUS RATING: | 225 | SOURCE LOCATION: | ELEC RM RM 117 | ACCESSORIES: | - |
| MCB MAX KVA RATING: | - | KAIC: | 10 | PANEL LOCATION: | ELEC RM RM 117 | ACCESSORIES: | - |
| SPARE KVA: | 81 | SPARE PERCENT: | 36% | | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BOILER 2 | | | | | | 10 | 15 | 1 | 0.0 | 0.0 | 2 | 15 | 10 | | | | | | RECEPT LOBBY |
| ERV-1 | | | | | | 10 | 15 | 3 | 0.0 | 0.0 | 4 | 15 | 10 | | | | | | DOD PROPERTY |
| DOD PROPERTY | | | | | | 10 | 15 | 5 | 0.0 | 0.0 | 6 | 15 | 10 | | | | | | RECEPT MECH, ELEC RM |
| HEATER TOILETS | | | | | | 10 | 20 | 7 | 0.0 | 0.0 | 8 | 15 | 10 | | | | | | RECEPT MECH, ELEC RM |
| PEF-1 1/50 HP DAMPER | | | | | | 10 | 20 | 9 | 0.0 | 0.0 | 10 | 20 | 10 | | | | | | CUH-4, 6 |
| CUH-2 &3 | | | | | | 10 | 20 | 11 | 0.0 | 0.0 | 12 | 20 | 10 | | | | | | CUH-5 |
| EXIT LTG | | | | | | 10 | 20 | 13 | 0.0 | 0.0 | 14 | 20 | 10 | | | | | | DRINKING FOUNTAIN, ILF-4 |
| PARKING LOT LTG | | | | | | 10 | 15 | 15 | 0.0 | 0.0 | 16 | 20 | 10 | | | | | | EUH-1 |
| | | | | | | | | 17 | 0.0 | 0.0 | 18 | | | | | | | | |
| PEF 4 & DAMPER | | | | | | 10 | 20 | 19 | 0.0 | 0.0 | 20 | 20 | 10 | | | | | | 30A PLUG |
| BOILER RM RECEPT | | | | | | 10 | 20 | 21 | 0.0 | 0.0 | 22 | 40 | 10 | | | | | | WASHER & DRYER MACHINE |
| AIR BOILER RM | | | | | | 10 | 20 | 23 | 0.0 | 0.0 | 24 | | | | | | | | |
| SPACE | | | | | | | | 25 | 0.0 | 0.0 | 26 | | | | | | | | SPACE |
| SPACE | | | | | | | | 27 | 0.0 | 0.0 | 28 | | | | | | | | SPACE |
| SPACE | | | | | | | | 29 | 0.0 | 0.0 | 30 | | | | | | | | SPACE |
| SPACE | | | | | | | | 31 | 0.0 | 0.0 | 32 | | | | | | | | SPACE |
| SPACE | | | | | | | | 33 | 0.0 | 0.0 | 34 | | | | | | | | SPACE |
| SPACE | | | | | | | | 35 | 0.0 | 0.0 | 36 | | | | | | | | SPACE |
| SPACE | | | | | | | | 37 | 0.0 | 0.0 | 38 | | | | | | | | SPACE |
| SPACE | | | | | | | | 39 | 0.0 | 0.0 | 40 | | | | | | | | SPACE |
| SPACE | | | | | | | | 41 | 0.0 | 0.0 | 42 | | | | | | | | SPACE |

LOAD SUMMARY PANEL

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.0 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 0.0 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | 0.0 | C-PHASE AMPS |

## NEW PANEL PPA

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 480/277 | PH-GRD VOLTAGE: | 277 | ACCESSORIES: | DOOR-IN-DOOR |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 480 | ACCESSORIES: | - |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PNL MDB | ACCESSORIES: | - |
| MCB TRIP AMPS: | - | BUS RATING: | 225 | SOURCE LOCATION: | ELEC RM RM 117 | ACCESSORIES: | - |
| MCB MAX KVA RATING: | - | KAIC: | 35 | PANEL LOCATION: | ELEC RM RM 117 | ACCESSORIES: | - |
| SPARE KVA: | 187 | SPARE PERCENT: | 83% | | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EUH-2 | | | | | | 35 | 15 | 1 | 0.0 | 0.0 | 2 | 15 | 35 | | | | | | AHU-1 |
| | | | | | | | | 3 | | | 4 | | | | | | | | |
| | | | | | | | | 5 | | | 6 | | | | | | | | |
| CHILL WTR PUMP P-1A | | | | | | 35 | 15 | 7 | 0.0 | 0.0 | 8 | 30 | 35 | | | | | | DUPLEX COMPRESSOR |
| | | | | | | | | 9 | | | 10 | | | | | | | | |
| | | | | | | | | 11 | | | 12 | | | | | | | | |
| CHILL WTR PUMP P-1B | | | | | | 35 | 15 | 13 | 0.0 | 0.0 | 14 | 15 | 35 | | | | | | OVERHEAD DOOR |
| | | | | | | | | 15 | | | 16 | | | | | | | | |
| | | | | | | | | 17 | | | 18 | | | | | | | | |
| HOT WTR PUMP P-2A | | | | | | 35 | 15 | 19 | 0.0 | 0.0 | 20 | 15 | 35 | | | | | | P-3; OAU-1 PUMP |
| | | | | | | | | 21 | | | 22 | | | | | | | | |
| | | | | | | | | 23 | | | 24 | | | | | | | | |
| HOT WTR PUMP P-2B | | | | | | 35 | 15 | 25 | 0.0 | 0.0 | 26 | 15 | 35 | | | | | | PUMP P-4 |
| | | | | | | | | 27 | | | 28 | | | | | | | | |
| | | | | | | | | 29 | | | 30 | | | | | | | | |
| OAU-2 INDOOR RM 115 | | | | | | 35 | 25 | 31 | 0.0 | 0.0 | 32 | 15 | 35 | | | | | | PUMP P-5 |
| | | | | | | | | 33 | | | 34 | | | | | | | | |
| | | | | | | | | 35 | | | 36 | | | | | | | | |
| OAU-1 MECH RM | | | | | | 35 | 20 | 37 | 0.0 | 0.0 | 38 | 15 | 35 | | | | | | INLINE FAN IF-3 |
| | | | | | | | | 39 | | | 40 | | | | | | | | |
| | | | | | | | | 41 | | | 42 | | | | | | | | |
| AIR COOLED CHILLER | | | | | | 35 | 150 | 43 | 0.0 | 0.0 | 44 | 20 | 35 | | | | | | SPARE |
| | | | | | | | | 45 | | | 46 | | | | | | | | |
| | | | | | | | | 47 | | | 48 | | | | | | | | |
| EXISTING CIRCUIT | | | | | | 35 | 15 | 49 | 0.0 | 0.0 | 50 | | | | | | | | SPACE |
| | | | | | | | | 51 | | | 52 | | | | | | | | |
| | | | | | | | | 53 | | | 54 | | | | | | | | |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| - | - | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | - | - |
| - | - | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | - | - |
| - | - | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | - | - |

## NEW PANEL LPE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 | ACCESSORIES: | DOOR-IN-DOOR |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 208 | ACCESSORIES: | - |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL DB | ACCESSORIES: | - |
| MCB TRIP AMPS: | - | BUS RATING: | 100 | SOURCE LOCATION: | ELEC RM RM 216 | ACCESSORIES: | - |
| MCB MAX KVA RATING: | - | KAIC: | 18 | PANEL LOCATION: | ELEC RM RM 117 | ACCESSORIES: | - |
| SPARE KVA: | 36 | SPARE PERCENT: | 36% | | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANNUNCIATION CTRL 204 | | | | | | 18 | 20 | 1 | 0.0 | 0.0 | 2 | 20 | 18 | | | | | | LTG COL D&F |
| LTG NORTH SIDE | | | | | | 18 | 20 | 3 | 0.0 | 0.0 | 4 | 20 | 18 | | | | | | LTG COL D&F WEST |
| LTG SOUTH & EAST | | | | | | 18 | 20 | 5 | 0.0 | 0.0 | 6 | 20 | 18 | | | | | | LTG COL1&2 SOUTH |
| NORTHWEST LTG POLE | | | | | | 18 | 20 | 7 | 0.0 | 0.0 | 8 | 20 | 18 | | | | | | LTG COL 1&2 |
| NORTHWEST LTG POLE | | | | | | 18 | 20 | 9 | 0.0 | 0.0 | 10 | 20 | 18 | | | | | | OCB BREEZEWAY |
| NORTHWEST LTG POLE | | | | | | 18 | 20 | 11 | 0.0 | 0.0 | 12 | 20 | 18 | | | | | | OCB BREEZEWAY |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.0 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 0.0 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | 0.0 | C-PHASE AMPS |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 POLE BREAKER | | | | | | | | 1 | 0.0 | 0.0 | 2 | | | | | | | | 1 POLE BREAKER |
| 2 POLE BREAKER | | | | | | | | 1 | 0.0 | 0.0 | 2 | | | | | | | | 2 POLE BREAKER |
| | | | | | | | | 3 | 0.0 | 0.0 | 4 | | | | | | | | |
| 3 POLE BREAKER | | | | | | | | 1 | 0.0 | 0.0 | 2 | | | | | | | | 3-POLE BREAKER |
| | | | | | | | | 3 | 0.0 | 0.0 | 4 | | | | | | | | |
| | | | | | | | | 5 | 0.0 | 0.0 | 6 | | | | | | | | |

## GENERAL NOTES

1. CONTRACTOR SHALL TRACE OUT AND CONFIRM EXISTING BRANCH CIRCUITS FOR PANELBOARDS WHERE EXISTING BRANCH CIRCUITS ARE RELOCATED TO A NEW PANELBOARD.


Whitman, Requardt & Associates, LLP
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ARLINGTON VIRGINIA

DEPARTMENT OF ENVIRONMENTAL SERVICES

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Fax: 703.228.3606


Seal

COMMONWEALTH OF VIRGINIA
IL HWAN KIM
Lic. No. 036555
8-7-23
PROFESSIONAL ENGINEER

| Approvals | Date |
|---|---|
| DESIGN TEAM SUPERVISOR | |
| CHIEF ENGINEERING BUREAU | |
| CHIEF WATER, SEWER STREETS BUREAU | |
| DEPARTMENT OF TRANSPORTATION | |

| Revisions | Date |
|---|---|
| | |
| | |
| | |
| | |
| | |

Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

ELECTRICAL SCHEDULES

Designed: IHK
Drawn: AGT
Checked: IHK
Miss Utility Transmittal #:

Filename: 90258015-E12.dwg
Path: N:\90258-015\CADD\
Plotted: Aug 07, 2023
Plotted by: cwolfe

Scale: NTS

Date: AUGUST 7, 2023

-

Sheet
E-12

## NEW PANEL PPD

| | | | | | |
|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 480Y/277 | PH-GRD VOLTAGE: | 277 | ACCESSORIES: | DOOR-IN-DOOR |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 480 | ACCESSORIES: | CLASS I DIV 1 ENCLOSURE |
| MCB FRAME SIZE: | 225 | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL MDP | ACCESSORIES: | - |
| MCB TRIP AMPS: | 125 | BUS RATING: | 225 | SOURCE LOCATION: | ELEC RM 117 | ACCESSORIES: | - |
| MCB MAX KVA RATING: | - | KAIC: | 35 | PANEL LOCATION: | PILOT RM | ACCESSORIES: | - |
| SPARE KVA: | 187 | SPARE PERCENT: | 83% | | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EUH-3 | | | | | | | 30/3 | 1 | 0.0 | 0.0 | 2 | 30/3 | | | | | | | EDH-1 |
| | | | | | | | | 3 | | | 4 | | | | | | | | |
| | | | | | | | | 5 | | | 6 | | | | | | | | |
| 45 KVA XFMR/PANEL LPD | 1 1/2" | EMT | (3) #4 | #8 | THWN | 35 | 70/3 | 7 | 0.0 | 0.0 | 8 | | | | | | | | SPACE |
| | | | | | | | | 9 | | | 10 | | | | | | | | |
| | | | | | | | | 11 | | | 12 | | | | | | | | |
| SPACE | | | | | | | | 13 | 0.0 | 0.0 | 14 | | | | | | | | SPACE |
| | | | | | | | | 15 | | | 16 | | | | | | | | |
| | | | | | | | | 17 | | | 18 | | | | | | | | |
| SPACE | | | | | | | | 19 | 0.0 | 0.0 | 20 | | | | | | | | SPACE |
| | | | | | | | | 21 | | | 22 | | | | | | | | |
| | | | | | | | | 23 | | | 24 | | | | | | | | |
| SPACE | | | | | | | | 25 | 0.0 | 0.0 | 26 | | | | | | | | SPACE |
| | | | | | | | | 27 | | | 28 | | | | | | | | |
| | | | | | | | | 29 | | | 30 | | | | | | | | |
| SPACE | | | | | | | | 31 | 0.0 | 0.0 | 32 | | | | | | | | SPACE |
| | | | | | | | | 33 | | | 34 | | | | | | | | |
| | | | | | | | | 35 | | | 36 | | | | | | | | |
| SPACE | | | | | | | | 37 | 0.0 | 0.0 | 38 | | | | | | | | SPACE |
| | | | | | | | | 39 | | | 40 | | | | | | | | |
| | | | | | | | | 41 | | | 42 | | | | | | | | |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| - | - | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | - | - |
| - | - | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | - | - |
| - | - | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | - | - |

## NEW PANEL LPD

| | | | | | |
|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 | ACCESSORIES: | DOOR-IN-DOOR |
| MCB OR MLO: | MCB | PHASE: | 3 | PH-PH VOLTAGE: | 208 | ACCESSORIES: | CLASS I DIV 1 ENCLOSURE |
| MCB FRAME SIZE: | 225 | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL PPD/45 KVA | ACCESSORIES: | - |
| MCB TRIP AMPS: | 150 | BUS RATING: | 225 | SOURCE LOCATION: | PILOT RM | ACCESSORIES: | - |
| MCB MAX KVA RATING: | 43 | KAIC: | 10 | PANEL LOCATION: | PILOT RM | ACCESSORIES: | - |
| SPARE KVA: | 43 | SPARE PERCENT: | 100% | | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LTG INSTRUMENTATION | | | | | | | 20 | 1 | 0.0 | 0.0 | 2 | 20 | | | | | | | RECEPTACLES |
| LTG OUTSIDE INST SHOP | | | | | | | 20 | 3 | 0.0 | 0.0 | 4 | 20 | | | | | | | RECEPTACLES |
| HOT WTR HEATER | | | | | | | 20 | 5 | 0.0 | 0.0 | 6 | 20 | | | | | | | SPARE |
| HOT WTR HEATER | | | | | | | 20 | 7 | 0.0 | 0.0 | 8 | 20 | | | | | | | SPARE |
| AC UNIT | | | | | | | 20 | 9 | 0.0 | 0.0 | 10 | 20 | | | | | | | ELEC FIN RADIATOR |
| EXHAUST FAN | | | | | | | 20 | 11 | 0.0 | 0.0 | 12 | | | | | | | | |
| RECEPTACLE - ENTRY OP | | | | | | | 20 | 13 | 1.7 | 0.0 | 14 | 20 | | | | | | | ELEC FIN RADIATOR |
| SPARE | | | | | | | 20 | 15 | 0.0 | 0.0 | 16 | | | | | | | | |
| SPACE | | | | | | | | 17 | 0.0 | 0.0 | 18 | | | | | | | | SPACE |
| SPACE | | | | | | | | 19 | 0.0 | 0.0 | 20 | | | | | | | | SPACE |
| SPACE | | | | | | | | 21 | 0.0 | 0.0 | 22 | | | | | | | | SPACE |
| SPACE | | | | | | | | 23 | 0.0 | 0.0 | 24 | | | | | | | | SPACE |
| SPACE | | | | | | | | 25 | 0.0 | 0.0 | 26 | | | | | | | | SPACE |
| SPACE | | | | | | | | 27 | 0.0 | 0.0 | 28 | | | | | | | | SPACE |
| SPACE | | | | | | | | 29 | 0.0 | 0.0 | 30 | | | | | | | | SPACE |
| SPACE | | | | | | | | 31 | 0.0 | 0.0 | 32 | | | | | | | | SPACE |
| SPACE | | | | | | | | 33 | 0.0 | 0.0 | 34 | | | | | | | | SPACE |
| SPACE | | | | | | | | 35 | 0.0 | 0.0 | 36 | | | | | | | | SPACE |
| SPACE | | | | | | | | 37 | 0.0 | 0.0 | 38 | | | | | | | | SPACE |
| SPACE | | | | | | | | 39 | 0.0 | 0.0 | 40 | | | | | | | | SPACE |
| SPACE | | | | | | | | 41 | 0.0 | 0.0 | 42 | | | | | | | | SPACE |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.2 | 0.6 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.2 | 100% | 0.2 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.2 | 0.6 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.2 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 1.7 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.3 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 0.9 | AMPS | | 0.0 | C-PHASE AMPS |

## NEW PANEL LPB SECTION 1

| | | | | | |
|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 | ACCESSORIES: | DOOR-IN-DOOR |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 208 | ACCESSORIES: | FEED THRU LUGS |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PNL DB | ACCESSORIES: | - |
| MCB TRIP AMPS: | - | BUS RATING: | 225 | SOURCE LOCATION: | ELEC RM RM 216 | ACCESSORIES: | - |
| MCB MAX KVA RATING: | - | KAIC: | 18 | PANEL LOCATION: | ELEC RM RM 216 | ACCESSORIES: | - |
| SPARE KVA: | 81 | SPARE PERCENT: | 36% | | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LTG MENS WASH/RM SHWR | | | | | | 18 | 20 | 1 | 0.0 | 0.0 | 2 | 20 | 18 | | | | | | LTG LUNCH, JAN, ELEC RM |
| LTG MENS LOCKER RM | | | | | | 18 | 20 | 3 | 0.0 | 0.0 | 4 | 20 | 18 | | | | | | LTG LUNCH, UNIFORM RM |
| LTG WOMENS WASH SHWR | | | | | | 18 | 20 | 5 | 0.0 | 0.0 | 6 | 20 | 18 | | | | | | LTG CORRIDOR |
| EXHIBITION TRACK LTG | | | | | | 18 | 20 | 7 | 0.0 | 0.0 | 8 | 20 | 18 | | | | | | LTG TRAINING RM |
| EXHIBITION TRACK LTG | | | | | | 18 | 20 | 9 | 0.0 | 0.0 | 10 | 20 | 18 | | | | | | LTG TRAINING RM |
| EXHIBITION TRACK LTG | | | | | | 18 | 20 | 11 | 0.0 | 0.0 | 12 | 20 | 18 | | | | | | MASTER FACP |
| 2ND FLR LTG & EMERG LTG | | | | | | 18 | 20 | 13 | 0.0 | 0.0 | 14 | 20 | 18 | | | | | | SPARE |
| LOBBY EXHIBITION LTG | | | | | | 18 | 20 | 15 | 0.0 | 0.0 | 16 | 20 | 18 | | | | | | LTG TEL, A/C RMS |
| STAIR #1 & EXHIBITION LOBBY | | | | | | 18 | 20 | 17 | 0.0 | 0.0 | 18 | 20 | 18 | | | | | | EXIT LTG |
| MOTORIZED SCREEN | | | | | | 18 | 20 | 19 | 0.0 | 0.0 | 20 | 20 | 18 | | | | | | ELEVATOR J-BOX |
| RECEPT TRAINING RM | | | | | | 18 | 20 | 21 | 0.0 | 0.0 | 22 | 20 | 18 | | | | | | LTG TRAINING RM |
| RECEPT TRAINING RM | | | | | | 18 | 20 | 23 | 0.0 | 0.0 | 24 | 20 | 18 | | | | | | LTG TRAINING RM |
| SPACE | | | | | | | | 25 | 0.0 | 0.0 | 26 | | | | | | | | SPACE |
| SPACE | | | | | | | | 27 | 0.0 | 0.0 | 28 | | | | | | | | SPACE |
| SPACE | | | | | | | | 29 | 0.0 | 0.0 | 30 | | | | | | | | SPACE |
| SPACE | | | | | | | | 31 | 0.0 | 0.0 | 32 | | | | | | | | SPACE |
| SPACE | | | | | | | | 33 | 0.0 | 0.0 | 34 | | | | | | | | SPACE |
| SPACE | | | | | | | | 35 | 0.0 | 0.0 | 36 | | | | | | | | SPACE |
| SPACE | | | | | | | | 37 | 0.0 | 0.0 | 38 | | | | | | | | SPACE |
| SPACE | | | | | | | | 39 | 0.0 | 0.0 | 40 | | | | | | | | SPACE |
| SPACE | | | | | | | | 41 | 0.0 | 0.0 | 42 | | | | | | | | SPACE |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.0 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 0.0 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | 0.0 | C-PHASE AMPS |

## NEW PANEL LPB SECTION 2

| | | | | | |
|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 | ACCESSORIES: | DOOR-IN-DOOR |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 208 | ACCESSORIES: | - |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PNL LPB-1 | ACCESSORIES: | - |
| MCB TRIP AMPS: | - | BUS RATING: | 225 | SOURCE LOCATION: | ELEC RM RM 216 | ACCESSORIES: | - |
| MCB MAX KVA RATING: | - | KAIC: | 18 | PANEL LOCATION: | ELEC RM RM 216 | ACCESSORIES: | - |
| SPARE KVA: | 81 | SPARE PERCENT: | 36% | | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DRINKING FOUNTAIN | | | | | | 18 | 20 | 43 | 0.0 | 0.0 | 44 | 20 | 18 | | | | | | KITCHEN SMALL RANGE |
| DRINKING FOUNTAIN | | | | | | 18 | 20 | 45 | 0.0 | 0.0 | 46 | | | | | | | | |
| RECEPTS LOBBY, REC STOR | | | | | | 18 | 20 | 47 | 0.0 | 0.0 | 48 | 40 | 18 | | | | | | LARGE RANGE |
| LTG RECORD STORAGE | | | | | | 18 | 20 | 49 | 0.0 | 0.0 | 50 | | | | | | | | |
| FIRE DOOR XFMR FEED | | | | | | 18 | 20 | 51 | 0.0 | 0.0 | 52 | 20 | 18 | | | | | | POWER AMPLIFIER |
| LTG EXHIBITION AREA | | | | | | 18 | 20 | 53 | 0.0 | 0.0 | 54 | 20 | 18 | | | | | | RECEPTS TELEPH RM |
| VENDING UNITS | | | | | | 18 | 20 | 55 | 0.0 | 0.0 | 56 | 20 | 18 | | | | | | RECEPTS CLEANER |
| SPARE | | | | | | 18 | 20 | 57 | 0.0 | 0.0 | 58 | 20 | 18 | | | | | | RECEPTS LUNCH, UNIFORM, |
| SPARE | | | | | | 18 | 20 | 59 | 0.0 | 0.0 | 60 | 20 | 18 | | | | | | RECEPTS, UNIFORM, ELEC |
| SPARE | | | | | | 18 | 20 | 61 | 0.0 | 0.0 | 62 | 20 | 18 | | | | | | SPARE |
| SPARE | | | | | | 18 | 20 | 63 | 0.0 | 0.0 | 64 | 20 | 18 | | | | | | SPARE |
| SPARE | | | | | | 18 | 20 | 65 | 0.0 | 0.0 | 66 | 20 | 18 | | | | | | SPARE |
| SPACE | | | | | | | | 67 | 0.0 | 0.0 | 68 | | | | | | | | SPACE |
| SPACE | | | | | | | | 69 | 0.0 | 0.0 | 70 | | | | | | | | SPACE |
| SPACE | | | | | | | | 71 | 0.0 | 0.0 | 72 | | | | | | | | SPACE |
| SPACE | | | | | | | | 73 | 0.0 | 0.0 | 74 | | | | | | | | SPACE |
| SPACE | | | | | | | | 75 | 0.0 | 0.0 | 76 | | | | | | | | SPACE |
| SPACE | | | | | | | | 77 | 0.0 | 0.0 | 78 | | | | | | | | SPACE |
| SPACE | | | | | | | | 79 | 0.0 | 0.0 | 80 | | | | | | | | SPACE |
| SPACE | | | | | | | | 81 | 0.0 | 0.0 | 82 | | | | | | | | SPACE |
| SPACE | | | | | | | | 83 | 0.0 | 0.0 | 84 | | | | | | | | SPACE |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.0 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 0.0 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | 0.0 | C-PHASE AMPS |

## GENERAL NOTES

1. CONTRACTOR SHALL TRACE OUT AND CONFIRM EXISTING BRANCH CIRCUITS FOR PANELBOARDS WHERE EXISTING BRANCH CIRCUITS ARE RELOCATED TO A NEW PANELBOARD.


Whitman, Requardt & Associates, LLP
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ARLINGTON VIRGINIA

DEPARTMENT OF ENVIRONMENTAL SERVICES

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Seal

COMMONWEALTH OF VIRGINIA
IL HWAN KIM
Lic. No. 036555
8-7-23
PROFESSIONAL ENGINEER

| Approvals | Date |
|---|---|
| DESIGN TEAM SUPERVISOR | |
| CHIEF ENGINEERING BUREAU | |
| CHIEF WATER, SEWER STREETS BUREAU | |
| DEPARTMENT OF TRANSPORTATION | |

| Revisions | Date |
|---|---|
| | |

Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

ELECTRICAL SCHEDULES

Designed: IHK
Drawn: AGT
Checked: IHK
Miss Utility Transmittal #:

Filename: 90258015-E13.dwg
Path: N:\90258-015\CADD\
Plotted: Aug 07, 2023
Plotted by: cwolfe

Scale: NTS

Date: AUGUST 7, 2023

-

Sheet
E-13

## NEW PANEL PPB

| | | | | | | |
|---|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 480/277 | PH-GRD VOLTAGE: | 277 | ACCESSORIES: DOOR-IN-DOOR |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 480 | ACCESSORIES: - |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL MDB | ACCESSORIES: - |
| MCB TRIP AMPS: | - | BUS RATING: | 100 | SOURCE LOCATION: | ELEC RM RM 117 | ACCESSORIES: - |
| MCB MAX KVA RATING: | - | KAIC: | 25 | PANEL LOCATION: | ELEC RM RM 216 | ACCESSORIES: - |
| SPARE KVA: | 83 | SPARE PERCENT: | 83% | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AIR COMPRESSOR 3RD FLR | | | | | | 25 | 20 | 1 | 0.0 | 0.0 | 2 | 20 | 25 | | | | | | ACU-2 |
| | | | | | | | | 3 | 0.0 | 0.0 | 4 | | | | | | | | |
| | | | | | | | | 5 | 0.0 | 0.0 | 6 | | | | | | | | |
| IN LINE EX FAN ILF-1 | | | | | | 25 | 20 | 7 | 0.0 | 0.0 | 8 | 15 | 25 | | | | | | CONDENSING UNIT TRAINING |
| | | | | | | | | 9 | 0.0 | 0.0 | 10 | | | | | | | | |
| | | | | | | | | 11 | 0.0 | 0.0 | 12 | | | | | | | | |
| VACUUM UNIT 3RD FLR | | | | | | 25 | 20 | 13 | 0.0 | 0.0 | 14 | 30 | 25 | | | | | | COMPRESSED AIR 3RD FLR |
| | | | | | | | | 15 | 0.0 | 0.0 | 16 | | | | | | | | |
| | | | | | | | | 17 | 0.0 | 0.0 | 18 | | | | | | | | |
| CONDENSING UNIT INSTRUM | | | | | | 25 | 20 | 19 | 0.0 | 0.0 | 20 | 20 | 25 | | | | | | DUCT HEATER HOOD #2 |
| | | | | | | | | 21 | 0.0 | 0.0 | 22 | | | | | | | | |
| | | | | | | | | 23 | 0.0 | 0.0 | 24 | | | | | | | | |
| DUCT HEATER HOOD #3 | | | | | | 25 | 20 | 25 | 0.0 | 0.0 | 26 | 20 | 25 | | | | | | DUCT HEATER HOOD #1 |
| | | | | | | | | 27 | 0.0 | 0.0 | 28 | | | | | | | | |
| | | | | | | | | 29 | 0.0 | 0.0 | 30 | | | | | | | | |
| SPACE | | | | | | | | 31 | 0.0 | 0.0 | 32 | 15 | 25 | | | | | | SPARE |
| | | | | | | | | 33 | 0.0 | 0.0 | 34 | | | | | | | | |
| | | | | | | | | 35 | 0.0 | 0.0 | 36 | | | | | | | | |
| SPACE | | | | | | | | 37 | 0.0 | 0.0 | 38 | | | | | | | | SPACE |
| | | | | | | | | 39 | 0.0 | 0.0 | 40 | | | | | | | | |
| | | | | | | | | 41 | 0.0 | 0.0 | 42 | | | | | | | | |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.0 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 0.0 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | 0.0 | C-PHASE AMPS |

## NEW PANEL PPE

| | | | | | | |
|---|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 | ACCESSORIES: DOOR-IN-DOOR |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 208 | ACCESSORIES: - |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL DB | ACCESSORIES: - |
| MCB TRIP AMPS: | - | BUS RATING: | 225 | SOURCE LOCATION: | ELEC RM RM 216 | ACCESSORIES: - |
| MCB MAX KVA RATING: | - | KAIC: | 18 | PANEL LOCATION: | ELEC RM RM 216 | ACCESSORIES: - |
| SPARE KVA: | 81 | SPARE PERCENT: | 36% | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPARE | | | | | | 18 | 1 | 1 | 0.0 | 0.0 | 2 | 20 | 18 | | | | | | ELECTRIC FIN RADIATOR |
| 2ND FLR UNIT HEATER | | | | | | 18 | 15 | 3 | 0.0 | 0.0 | 4 | | | | | | | | |
| SPARE | | | | | | 18 | 15 | 5 | 0.0 | 0.0 | 6 | 15 | 18 | | | | | | CABINET UNIT HEATER #8, 9 |
| EUH-4 | | | | | | 18 | 15 | 7 | 0.0 | 0.0 | 8 | 15 | 18 | | | | | | FAN COOLING UNIT |
| | | | | | | | | 9 | 0.0 | 0.0 | 10 | 15 | 18 | | | | | | CABINET UNIT HEATER #7 |
| SPARE | | | | | | 18 | 15 | 11 | 0.0 | 0.0 | 12 | 20 | 18 | | | | | | ELECTRIC FIN RADIATOR |
| | | | | | | | | 13 | 0.0 | 0.0 | 14 | | | | | | | | |
| SPARE | | | | | | 18 | 15 | 15 | 0.0 | 0.0 | 16 | 20 | 18 | | | | | | SPARE |
| | | | | | | | | 17 | 0.0 | 0.0 | 18 | 20 | 18 | | | | | | SPARE |
| SPARE | | | | | | 18 | 25 | 19 | 0.0 | 0.0 | 20 | 20 | 18 | | | | | | SPARE |
| | | | | | | | | 21 | 0.0 | 0.0 | 22 | 30 | 18 | | | | | | SPARE |
| SPARE | | | | | | 18 | 20 | 23 | 0.0 | 0.0 | 24 | | | | | | | | |
| SPACE | | | | | | | | 25 | 0.0 | 0.0 | 26 | | | | | | | | SPACE |
| SPACE | | | | | | | | 27 | 0.0 | 0.0 | 28 | | | | | | | | SPACE |
| SPACE | | | | | | | | 29 | 0.0 | 0.0 | 30 | | | | | | | | SPACE |
| SPACE | | | | | | | | 31 | 0.0 | 0.0 | 32 | | | | | | | | SPACE |
| SPACE | | | | | | | | 33 | 0.0 | 0.0 | 34 | | | | | | | | SPACE |
| SPACE | | | | | | | | 35 | 0.0 | 0.0 | 36 | | | | | | | | SPACE |
| SPACE | | | | | | | | 37 | 0.0 | 0.0 | 38 | | | | | | | | SPACE |
| SPACE | | | | | | | | 39 | 0.0 | 0.0 | 40 | | | | | | | | SPACE |
| SPACE | | | | | | | | 41 | 0.0 | 0.0 | 42 | | | | | | | | SPACE |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.0 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 0.0 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | 0.0 | C-PHASE AMPS |

## NEW PANEL PPF

| | | | | | | |
|---|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 480/277 | PH-GRD VOLTAGE: | 277 | ACCESSORIES: DOOR-IN-DOOR |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 480 | ACCESSORIES: - |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL MDB | ACCESSORIES: - |
| MCB TRIP AMPS: | - | BUS RATING: | 100 | SOURCE LOCATION: | ELEC RM 117 | ACCESSORIES: - |
| MCB MAX KVA RATING: | - | KAIC: | 35 | PANEL LOCATION: | HVAC/SPRINKLER 201 | ACCESSORIES: - |
| SPARE KVA: | 83 | SPARE PERCENT: | 83% | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OCB-CRAC-01 | | | | | | | 40/3 | 1 | 0.0 | 0.0 | 2 | 50/3 | | | | | | | DUCT HEATER |
| | | | | | | | | 3 | | | 4 | | | | | | | | |
| | | | | | | | | 5 | | | 6 | | | | | | | | |
| ACC-01-02 | | | | | | | 20/3 | 7 | 0.0 | 0.0 | 8 | 40/3 | | | | | | | OCB-CRAC-02 |
| | | | | | | | | 9 | | | 10 | | | | | | | | |
| | | | | | | | | 11 | | | 12 | | | | | | | | |
| AC | | | | | | | 30/3 | 13 | 0.0 | 0.0 | 14 | 30/3 | | | | | | | UPS |
| | | | | | | | | 15 | | | 16 | | | | | | | | |
| | | | | | | | | 17 | | | 18 | | | | | | | | |
| UPS | | | | | | | 90/3 | 19 | 0.0 | 0.0 | 20 | | | | | | | | SPACE |
| | | | | | | | | 21 | | | 22 | | | | | | | | |
| | | | | | | | | 23 | | | 24 | | | | | | | | |
| SPACE | | | | | | | 90/3 | 25 | 0.0 | 0.0 | 26 | | | | | | | | SPACE |
| | | | | | | | | 27 | | | 28 | | | | | | | | |
| | | | | | | | | 29 | | | 30 | | | | | | | | |
| SPACE | | | | | | | | 31 | 0.0 | 0.0 | 32 | | | | | | | | SPACE |
| | | | | | | | | 33 | | | 34 | | | | | | | | |
| | | | | | | | | 35 | | | 36 | | | | | | | | |
| SPACE | | | | | | | | 37 | 0.0 | 0.0 | 38 | | | | | | | | SPACE |
| | | | | | | | | 39 | | | 40 | | | | | | | | |
| | | | | | | | | 41 | | | 42 | | | | | | | | |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| - | - | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | - | - |
| - | - | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | - | - |
| - | - | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | - | - |

## NEW PANEL PPG

| | | | | | | |
|---|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 | ACCESSORIES: DOOR-IN-DOOR |
| MCB OR MLO: | MCB | PHASE: | 3 | PH-PH VOLTAGE: | 208 | ACCESSORIES: - |
| MCB FRAME SIZE: | 100A | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL DB | ACCESSORIES: - |
| MCB TRIP AMPS: | 70 | BUS RATING: | 225 | SOURCE LOCATION: | ELEC RM 216 | ACCESSORIES: - |
| MCB MAX KVA RATING: | 20 | KAIC: | 18 | PANEL LOCATION: | HVAC/SPRINKLER 201 | ACCESSORIES: - |
| SPARE KVA: | 20 | SPARE PERCENT: | 100% | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COMPUTER AUXILIARIES | | | | | | | 70/2 | 1 | 0.0 | 0.0 | 2 | 20 | | | | | | | FIRE SUPPRESSION |
| | | | | | | | | 3 | 0.0 | 0.0 | 4 | 100/2 | | | | | | | UPS 120V BYPASS |
| AC UNIT COMP RM | | | | | | | 20/2 | 5 | 0.0 | 0.0 | 6 | | | | | | | | |
| | | | | | | | | 7 | 0.0 | 0.0 | 8 | 40/2 | | | | | | | SPARE |
| NEVADA PNL | | | | | | | 20 | 9 | 0.0 | 0.0 | 10 | | | | | | | | |
| ATC PANEL | | | | | | | 20 | 11 | 0.0 | 0.0 | 12 | 20 | | | | | | | RECEPT CONTRL RM |
| SPARE | | | | | | | 20 | 13 | 0.0 | 0.0 | 14 | 20 | | | | | | | RECEPT COMPUTER RM |
| ELECTRIC FIN RADIATOR | | | | | | | 20/2 | 15 | 0.0 | 0.0 | 16 | 20 | | | | | | | RECEPT BACK UP RM |
| | | | | | | | | 17 | 0.0 | 0.0 | 18 | 20/2 | | | | | | | ELEC FIN RADIATOR |
| RECEPT FOR TELE | | | | | | | 20 | 19 | 0.0 | 0.0 | 20 | | | | | | | | |
| RECEPT FOR TELE | | | | | | | 20 | 21 | 0.0 | 0.0 | 22 | 50/2 | | | | | | | DTS NETWORK UPS |
| SPARE | | | | | | | 20 | 23 | 0.0 | 0.0 | 24 | | | | | | | | |
| SPARE | | | | | | | 20 | 25 | 0.0 | 0.0 | 26 | | | | | | | | SPACE |
| SPARE | | | | | | | 20 | 27 | 0.0 | 0.0 | 28 | | | | | | | | SPACE |
| SPARE | | | | | | | | 29 | 0.0 | 0.0 | 30 | | | | | | | | SPACE |
| SPACE | | | | | | | | 31 | 0.0 | 0.0 | 32 | | | | | | | | SPACE |
| SPACE | | | | | | | | 33 | 0.0 | 0.0 | 34 | | | | | | | | SPACE |
| SPACE | | | | | | | | 35 | 0.0 | 0.0 | 36 | | | | | | | | SPACE |
| SPACE | | | | | | | | 37 | 0.0 | 0.0 | 38 | | | | | | | | SPACE |
| SPACE | | | | | | | | 39 | 0.0 | 0.0 | 40 | | | | | | | | SPACE |
| SPACE | | | | | | | | 41 | 0.0 | 0.0 | 42 | | | | | | | | SPACE |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.0 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 0.0 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | 0.0 | C-PHASE AMPS |

## GENERAL NOTES

1. CONTRACTOR SHALL TRACE OUT AND CONFIRM EXISTING BRANCH CIRCUITS FOR PANELBOARDS WHERE EXISTING BRANCH CIRCUITS ARE RELOCATED TO A NEW PANELBOARD.


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IL HWAN KIM
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8-7-23
PROFESSIONAL ENGINEER

Approvals Date

DESIGN TEAM SUPERVISOR

CHIEF ENGINEERING BUREAU

CHIEF WATER, SEWER STREETS BUREAU

DEPARTMENT OF TRANSPORTATION

Revisions Date

Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

ELECTRICAL SCHEDULES

Designed: IHK
Drawn: AGT
Checked: IHK
Miss Utility Transmittal #:

Filename: 90258015-E14.dwg
Path: N:\90258-015\CADD\
Plotted: Aug 07, 2023
Plotted by: cwolfe

Scale: NTS

Date: AUGUST 7, 2023

-

Sheet
E-14

## EX PANEL LPX

| | | | | | |
|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 208 |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | 30 KVA XFMR |
| MCB TRIP AMPS: | - | BUS RATING: | 125 | SOURCE LOCATION: | CONTROL RM |
| MCB MAX KVA RATING: | - | AVAILABLE KAIC: | 10 | PANEL LOCATION: | CONTROL RM |
| SPARE KVA: | 45 | SPARE PERCENT: | 36% | | |

| ACCESSORIES: | - |
|---|---|
| ACCESSORIES: | - |
| ACCESSORIES: | - |
| ACCESSORIES: | - |
| ACCESSORIES: | - |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1ST FLR LIGHTING | | | | | | 10 | 20 | 1 | 0.0 | 0.0 | 2 | 20 | 10 | | | | | | 1ST FLR RECEPTACLES |
| 1ST FLR LIGHTING | | | | | | 10 | 20 | 3 | 0.0 | 0.0 | 4 | 20 | 10 | | | | | | 1ST FLR RECEPTACLES |
| 2ND FLR LIGHTING | | | | | | 10 | 20 | 5 | 0.0 | 0.0 | 6 | 20 | 10 | | | | | | 1ST FLR RECEPTACLES |
| 2ND FLR LIGHTING | | | | | | 10 | 20 | 7 | 0.0 | 0.0 | 8 | 20 | 10 | | | | | | 1ST FLR RECEPTACLES |
| 2ND FLR RECEPTACLES | | | | | | 10 | 20 | 9 | 0.0 | 0.0 | 10 | 20 | 10 | | | | | | RECEPTACLE TELEMETRY |
| 2ND FLR RECEPTACLES | | | | | | 10 | 20 | 11 | 0.0 | 0.0 | 12 | 20 | 10 | | | | | | BENTLEY NEVADA PNL |
| 2ND FLR RECEPTACLES | | | | | | 10 | 20 | 13 | 0.0 | 0.0 | 14 | 20 | 10 | | | | | | EXHAUST FAN |
| JUNCTION BOX 2ND FLR | | | | | | 10 | 20 | 15 | 0.0 | 0.0 | 16 | 20 | 10 | | | | | | FM 200 PNL; ATC PNL |
| JUNCTION BOX 2ND FLR | | | | | | 10 | 20 | 17 | 0.0 | 0.0 | 18 | 20 | 10 | | | | | | SPARE UNDER FLR JBOX |
| HEAT TRACE | | | | | | 10 | 20 | 19 | 0.0 | 0.0 | 20 | 20 | 10 | | | | | | FACP |
| TEMP POWER | | | | | | 10 | 20 | 21 | 0.0 | 0.0 | 22 | 20 | 10 | | | | | | NEW UPS |
| | | | | | | | | 23 | 0.0 | 0.0 | 24 | 20 | 10 | | | | | | NEW NET CABINET NC-4 |
| SPARE 120V OUTLET | | | | | | 10 | 20 | 25 | 0.0 | 0.0 | 26 | 20 | 10 | | | | | | CONTROL RM LIGHTING |
| CONTROL RM LIGHTING | | | | | | 10 | 20 | 27 | 0.0 | 0.0 | 28 | 20 | 10 | | | | | | RECEPT RM 206 |
| LTG RM 206 NETWORK | | | | | | 10 | 20 | 29 | 0.0 | 0.0 | 30 | 20 | 10 | | | | | | NETWORK RM PNL SCP |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.0 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 0.0 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | 0.0 | C-PHASE AMPS |

## NEW PANEL LPC

| | | | | | |
|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 208 |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL DB |
| MCB TRIP AMPS: | - | BUS RATING: | 225 | SOURCE LOCATION: | ELEC RM216 |
| MCB MAX KVA RATING: | - | KAIC: | 10 | PANEL LOCATION: | ELEC RM 321 |
| SPARE KVA: | 80 | SPARE PERCENT: | 36% | | |

| ACCESSORIES: | DOOR-IN-DOOR |
|---|---|
| ACCESSORIES: | - |
| ACCESSORIES: | - |
| ACCESSORIES: | - |
| ACCESSORIES: | - |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LTG SHIFT SUPERVISOR | | | | | | 10 | 20 | 1 | 0.0 | 0.0 | 2 | 20 | 10 | | | | | | LTG CORRIDOR |
| RECEPTS - GEN OFF 312 | | | | | | 10 | 20 | 3 | 3.2 | 0.0 | 4 | 20 | 10 | | | | | | LTG GEN OFFICE |
| LTG PROCESS CTRL ENG | | | | | | 10 | 20 | 5 | 0.0 | 0.0 | 6 | 20 | 10 | | | | | | LTG GEN OFFICE |
| LTG LIBRARY | | | | | | 10 | 20 | 7 | 0.0 | 0.0 | 8 | 20 | 10 | | | | | | 1ST FLR RECEPTACLES |
| LTG GEN LABORATORY | | | | | | 10 | 20 | 9 | 0.0 | 0.0 | 10 | 20 | 10 | | | | | | LTG CHEMISTRY ASSIT OFF |
| LTG GEN LABORATORY | | | | | | 10 | 20 | 11 | 0.0 | 0.0 | 12 | 20 | 10 | | | | | | LTG INSTRUMENT RM |
| LTG GEN LABORATORY | | | | | | 10 | 20 | 13 | 0.0 | 0.0 | 14 | 20 | 10 | | | | | | LTG WPCD CHIEF OFFICE |
| RECEPT ELEC RM. AIR COMP | | | | | | 10 | 20 | 15 | 0.0 | 0.0 | 16 | 20 | 10 | | | | | | LTG OPERATOR RM |
| RECEPT CLEANING | | | | | | 10 | 20 | 17 | 0.0 | 0.0 | 18 | 20 | 10 | | | | | | EXIT LTG |
| FLOOR RECEPT OFFICE | | | | | | 10 | 20 | 19 | 0.0 | 0.0 | 20 | 20 | 10 | | | | | | ROOF FAN #3 |
| FLOOR RECEPT OFFICE | | | | | | 10 | 20 | 21 | 0.0 | 0.0 | 22 | 20 | 10 | | | | | | ROOF FAN #1 |
| FLOOR RECEPT OFFICE | | | | | | 10 | 20 | 23 | 0.0 | 0.0 | 24 | 20 | 10 | | | | | | ROOF FAN #2 |
| FLOOR RECEPT OFFICE | | | | | | 10 | 20 | 25 | 0.0 | 0.0 | 26 | 20 | 10 | | | | | | FLOOR RECEPTS |
| DRINKING FOUNTAIN | | | | | | 10 | 20 | 27 | 0.0 | 0.0 | 28 | 20 | 10 | | | | | | FLOOR RECEPTS |
| DRINKING FOUNTAIN | | | | | | 10 | 20 | 29 | 0.0 | 0.0 | 30 | 20 | 10 | | | | | | RECEPT CLEANING |
| ROOF FAN #7 | | | | | | 10 | 20 | 31 | 0.0 | 0.0 | 32 | 20 | 10 | | | | | | RECEPT LIBRARY |
| LTG ELEC. TOILET, STORAGE | | | | | | 10 | 20 | 33 | 0.0 | 0.0 | 34 | 20 | 10 | | | | | | LTG WAITING AREA |
| FURNACE | | | | | | 10 | 40 | 35 | 0.0 | 0.0 | 36 | 20 | 10 | | | | | | LTG CORRIDOR |
| | | | | | | | | 37 | 0.0 | 4.9 | 38 | 20 | 10 | | | | | | RECEPTS - GEN OFF 312 |
| KITCHEN UNIT B | | | | | | 10 | 40 | 39 | 0.0 | 0.0 | 40 | 40 | 10 | | | | | | SPARE |
| | | | | | | | | 41 | 0.0 | 0.0 | 42 | | | | | | | | |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 1.0 | 2.7 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 1.0 | 100% | 1.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 1.0 | 2.7 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.6 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 4.9 | A-PHASE AMPS |
| B-PHASE KVA | 0.4 | CONTINUOUS LOAD FACTOR: | | 1.25 | 1.5 | KVA | | 3.2 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 4.2 | AMPS | | 0.0 | C-PHASE AMPS |

## NEW PANEL PPC SECTION 1

| | | | | | |
|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 |
| MCB OR MLO: | MCB | PHASE: | 3 | PH-PH VOLTAGE: | 208 |
| MCB FRAME SIZE: | 225 | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL DB |
| MCB TRIP AMPS: | 225 | BUS RATING: | 225 | SOURCE LOCATION: | ELEC RM RM 216 |
| MCB MAX KVA RATING: | 65 | KAIC: | 10 | PANEL LOCATION: | ELEC RM RM 323 |
| SPARE KVA: | 64 | SPARE PERCENT: | 99% | | |

| ACCESSORIES: | DOOR-IN-DOOR |
|---|---|
| ACCESSORIES: | SHUNT TRIP MCB |
| ACCESSORIES: | FEED THRU LUGS |
| ACCESSORIES: | - |
| ACCESSORIES: | - |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B&D INCUBATOR RECEPT | | | | | | 10 | 20 | 1 | 0.0 | 0.0 | 2 | 20 | 10 | | | | | | RECEPT LAB BENCHES |
| RECEPT LAB BENCHES | | | | | | 10 | 20 | 3 | 0.0 | 0.0 | 4 | 20 | 10 | | | | | | RECEPT LAB BENCHES |
| REFRIGERATOR RECEPT | | | | | | 10 | 20 | 5 | 0.0 | 0.0 | 6 | 20 | 10 | | | | | | RECEPT LAB BENCHES |
| RECEPT LAB BENCHES | | | | | | 10 | 20 | 7 | 0.0 | 0.0 | 8 | 20 | 10 | | | | | | RECEPT LAB BENCHES |
| RECEPT LAB BENCHES | | | | | | 10 | 20 | 9 | 0.0 | 0.0 | 10 | 20 | 10 | | | | | | RECEPT LAB BENCHES |
| RECEPT LAB BENCHES | | | | | | 10 | 20 | 11 | 0.0 | 0.0 | 12 | 20 | 10 | | | | | | RECEPT LAB BENCHES |
| RECEPT INST RM | | | | | | 10 | 20 | 13 | 0.0 | 0.0 | 14 | 20 | 10 | | | | | | RECEPT INST RM |
| RECEPT INST RM | | | | | | 10 | 20 | 15 | 0.0 | 0.0 | 16 | 20 | 10 | | | | | | RECEPT INST RM |
| RECEPT BATERIOLOGY RM | | | | | | 10 | 20 | 17 | 0.0 | 0.0 | 18 | 20 | 10 | | | | | | RECEPT BACTERIOLOGY |
| RECEPT ASSIST CHEM RM | | | | | | 10 | 20 | 19 | 0.0 | 0.0 | 20 | 20 | 10 | | | | | | RECEPT BACTERIOLOGY |
| RECEPT ASSIST CHEM RM | | | | | | 10 | 20 | 21 | 0.0 | 0.0 | 22 | 20 | 10 | | | | | | RECEPT BACTERIOLOGY |
| RECEPT ASSIST CHEM RM | | | | | | 10 | 20 | 23 | 0.0 | 0.0 | 24 | 20 | 10 | | | | | | RECEPT CHEMIST RM |
| RECEPT WASHUP RM | | | | | | 10 | 20 | 25 | 0.0 | 0.0 | 26 | 20 | 10 | | | | | | NEW ATOMIC ABSORPTION |
| IN LINE EXHAUST FAN #2 | | | | | | 10 | 20 | 27 | 0.0 | 0.0 | 28 | 20 | 10 | | | | | | NEW ATOMIC ABSORPTION |
| RECEPT INST RM 328 | | | | | | 10 | 20 | 29 | 0.0 | 0.0 | 30 | 20 | 10 | | | | | | RECEPT GEN LAB |
| SUPPLY/EXHAUST FANS #1 | | | | | | 10 | 20 | 31 | 0.0 | 0.0 | 32 | 20 | 10 | | | | | | RECEPT LAB |
| EXHAUST FAN #4 | | | | | | 10 | 20 | 33 | 0.0 | 0.0 | 34 | 20 | 10 | | | | | | LAB LIGHTING |
| SUPPLY/EXHAUST FANS #3, 4 | | | | | | 10 | 20 | 35 | 0.0 | 0.0 | 36 | 20 | 10 | | | | | | SUPPLY/EXHAUST FAN #2 |
| RECEPT - 329, 330 | 3/4" | EMT | #12 | #12 | THWN | 10 | 20 | 37 | 3.0 | 0.0 | 38 | 20 | 10 | | | | | | SPARE |
| SPARE | | | | | | 10 | 20 | 39 | 0.0 | 0.0 | 40 | 20 | 10 | | | | | | SPARE |
| SPARE | | | | | | 10 | 20 | 41 | 0.0 | 0.0 | 42 | 20 | 10 | | | | | | SPARE |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.4 | 1.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.4 | 100% | 0.4 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.4 | 1.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.4 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 3.0 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.6 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 1.6 | AMPS | | 0.0 | C-PHASE AMPS |

## NEW PANEL PPC SECTION 2

| | | | | | |
|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 208 |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL DB |
| MCB TRIP AMPS: | - | BUS RATING: | 225 | SOURCE LOCATION: | ELEC RM RM 216 |
| MCB MAX KVA RATING: | - | KAIC: | 10 | PANEL LOCATION: | ELEC RM RM 323 |
| SPARE KVA: | 80 | SPARE PERCENT: | 36% | | |

| ACCESSORIES: | DOOR-IN-DOOR |
|---|---|
| ACCESSORIES: | - |
| ACCESSORIES: | - |
| ACCESSORIES: | - |
| ACCESSORIES: | - |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FAN COIL UNIT #43 | | | | | | 10 | 20 | 43 | 0.0 | 0.0 | 44 | 20 | 10 | | | | | | FAN COIL UNIT #44 |
| FAN COIL UNIT #45 | | | | | | 10 | 20 | 45 | 0.0 | 0.0 | 46 | 20 | 10 | | | | | | FAN COIL UNIT #46 |
| FAN COIL UNIT #41 | | | | | | 10 | 20 | 47 | 0.0 | 0.0 | 48 | 20 | 10 | | | | | | FAN COIL UNIT #42 |
| AA IN LINE FAN #R2 | | | | | | 10 | 20 | 49 | 0.0 | 0.0 | 50 | 20 | 10 | | | | | | ROOF EXHAUST FAN #4 |
| EUH #5 | | | | | | 10 | 20 | 51 | 0.0 | 0.0 | 52 | 20 | 10 | | | | | | ROOF EXHAUST FAN #5 |
| | | | | | | | | 53 | 0.0 | 0.0 | 54 | 20 | 10 | | | | | | ROOF EXHAUST FAN #6 |
| FUME HOOD HOPLET HTR | | | | | | 10 | 20 | 55 | 0.0 | 0.0 | 56 | | | | | | | | |
| DISHWASHER | | | | | | 10 | 40 | 57 | 0.0 | 0.0 | 58 | 30 | 10 | | | | | | KJELDAHL UNIT STERILMATIC |
| MUFFLE FURNACE RECEPT | | | | | | 10 | 20 | 59 | 0.0 | 0.0 | 60 | | | | | | | | |
| | | | | | | | | 61 | 0.0 | 0.0 | 62 | | | | | | | | |
| | | | | | | | | 63 | 0.0 | 0.0 | 64 | 20 | 10 | | | | | | STILL RECEPT |
| 208V VACUUM OUTLET | | | | | | 10 | 20 | 65 | 0.0 | 0.0 | 66 | | | | | | | | |
| | | | | | | | | 67 | 0.0 | 0.0 | 68 | 20 | 10 | | | | | | 208V OUTLET FUME HOOD #4 |
| | | | | | | | | 69 | 0.0 | 0.0 | 70 | | | | | | | | |
| LAB TESTER MACHINE | | | | | | 10 | 30 | 71 | 0.0 | 3.2 | 72 | 20 | 10 | | | | | | RECEPT - LAB 327 |
| LAB TESTER MACHINE | | | | | | 10 | 30 | 73 | 0.0 | 3.2 | 74 | 20 | 10 | | | | | | RECEPT - LAB 327 |
| SPARE | | | | | | 10 | 20 | 75 | 0.0 | 3.2 | 76 | 20 | 10 | | | | | | RECEPT - LAB 327 |
| SPARE | | | | | | 10 | 20 | 77 | 0.0 | 0.0 | 78 | 20 | 10 | | | | | | SPARE |
| SPARE | | | | | | 10 | 20 | 79 | 0.0 | 0.0 | 80 | 20 | 10 | | | | | | SPARE |
| SPARE | | | | | | 10 | 20 | 81 | 0.0 | 0.0 | 82 | 20 | 10 | | | | | | SPARE |
| SPARE | | | | | | 10 | 20 | 83 | 0.0 | 0.0 | 84 | 20 | 10 | | | | | | SPARE |

LOAD SUMMARY PANEL:

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 1.2 | 3.2 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 1.2 | 100% | 1.2 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 1.2 | 3.2 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.4 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 3.2 | A-PHASE AMPS |
| B-PHASE KVA | 0.4 | CONTINUOUS LOAD FACTOR: | | 1.25 | 1.8 | KVA | | 3.2 | B-PHASE AMPS |
| C-PHASE KVA | 0.4 | FUTURE LOAD FACTOR: | | 1.25 | 5.0 | AMPS | | 3.2 | C-PHASE AMPS |

## GENERAL NOTES

1. CONTRACTOR SHALL TRACE OUT AND CONFIRM EXISTING BRANCH CIRCUITS FOR PANELBOARDS WHERE EXISTING BRANCH CIRCUITS ARE RELOCATED TO A NEW PANELBOARD.


Whitman, Requardt & Associates, LLP
801 South Caroline Street, Baltimore, Maryland 21231





ARLINGTON VIRGINIA

DEPARTMENT OF ENVIRONMENTAL SERVICES

Engineering & Capital Projects Division
Engineering Bureau
2100 Clarendon Boulevard, Suite 813
Arlington, VA 22201
Phone: 703.228.3629
Fax: 703.228.3606


Seal

COMMONWEALTH OF VIRGINIA
IL HWAN KIM
Lic. No. 036555
8-7-23
PROFESSIONAL ENGINEER

Approvals Date

DESIGN TEAM SUPERVISOR

CHIEF ENGINEERING BUREAU

CHIEF WATER, SEWER STREETS BUREAU

DEPARTMENT OF TRANSPORTATION

Revisions Date

Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

ELECTRICAL SCHEDULES

Designed: IHK
Drawn: AGT
Checked: IHK
Miss Utility Transmittal #:

Filename: 90258015-E15.dwg
Path: N:\90258-015\CADD\
Plotted: Aug 07, 2023
Plotted by: cwolfe

Scale: NTS

Date: AUGUST 7, 2023

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Sheet
E-15

## EX PANEL PPJ

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 208/120 | PH-GRD VOLTAGE: | 120 | ACCESSORIES: | - |
| MCB OR MLO: | MLO | PHASE: | 3 | PH-PH VOLTAGE: | 208 | ACCESSORIES: | - |
| MCB FRAME SIZE: | - | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | PANEL DB | ACCESSORIES: | - |
| MCB TRIP AMPS: | - | BUS RATING: | - | SOURCE LOCATION: | ELEC RM 216 | ACCESSORIES: | - |
| MCB MAX KVA RATING: | | KAIC: | 10 | PANEL LOCATION: | ELEC RM 323 | ACCESSORIES: | - |
| SPARE KVA: | ########## | SPARE PERCENT: | ###### | | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FCU | | | | | | | 15 | 1 | 0.0 | 0.0 | 2 | 15 | | | | | | | TV, KITCHEN RECEPT |
| | | | | | | | | 3 | 0.0 | 0.0 | 4 | 20 | | | | | | | ILF-2 |
| FCU | | | | | | | 15 | 5 | 0.0 | 0.0 | 6 | 20 | | | | | | | SIDE ROOF RECEPTS |
| | | | | | | | | 7 | 0.0 | 0.0 | 8 | 20 | | | | | | | HVAC CONTROLS |
| FCU | | | | | | | 15 | 9 | 0.0 | 0.0 | 10 | 20 | | | | | | | RECEPTS 300,301,302,304 |
| | | | | | | | | 11 | 0.0 | 0.0 | 12 | 20 | | | | | | | MAIN ROOF RECEPTS |
| SPARE KVA: | | | | | | | 20 | 13 | 0.0 | 0.0 | 14 | 30 | | | | | | | CU-1A |
| NEW OFFICE RECEPTS | | | | | | | 20 | 15 | 0.0 | 0.0 | 16 | | | | | | | | |
| RF-3 | | | | | | | 20 | 17 | 0.0 | 0.0 | 18 | 30 | | | | | | | CU-1B |
| OPS MANAGER OUTLET | | | | | | | 20 | 19 | 0.0 | 0.0 | 20 | | | | | | | | |
| SPACE | | | | | | | | 21 | 0.0 | 0.0 | 22 | | | | | | | | SPACE |
| SPACE | | | | | | | | 23 | 0.0 | 0.0 | 24 | | | | | | | | SPACE |
| SPACE | | | | | | | | 25 | 0.0 | 0.0 | 26 | | | | | | | | SPACE |
| SPACE | | | | | | | | 27 | 0.0 | 0.0 | 28 | | | | | | | | SPACE |
| SPACE | | | | | | | | 29 | 0.0 | 0.0 | 30 | | | | | | | | SPACE |
| SPACE | | | | | | | | 31 | 0.0 | 0.0 | 32 | | | | | | | | SPACE |
| SPACE | | | | | | | nnnn | 33 | 0.0 | 0.0 | 34 | | | | | | | | SPACE |
| SPACE | | | | | | | | 35 | 0.0 | 0.0 | 36 | | | | | | | | SPACE |
| SPACE | | | | | | | | 37 | 0.0 | 0.0 | 38 | | | | | | | | SPACE |
| SPACE | | | | | | | | 39 | 0.0 | 0.0 | 40 | | | | | | | | SPACE |
| SPACE | | | | | | | | 41 | 0.0 | 0.0 | 42 | | | | | | | | SPACE |

LOAD SUMMARY PANEL

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.0 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 0.0 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | 0.0 | C-PHASE AMPS |

## EX PANEL PPK

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MOUNTING: | SURFACE | VOLTAGE: | 480/277 | PH-GRD VOLTAGE: | 277 | ACCESSORIES: | - |
| MCB OR MLO: | MCB | PHASE: | 3 | PH-PH VOLTAGE: | 480 | ACCESSORIES: | - |
| MCB FRAME SIZE: | 225 | BUS MATERIAL: | CU | SOURCE EQUIPMENT: | - | ACCESSORIES: | - |
| MCB TRIP AMPS: | 225 | BUS RATING: | 225 | SOURCE LOCATION: | - | ACCESSORIES: | - |
| MCB MAX KVA RATING: | 150 | KAIC: | 25 | PANEL LOCATION: | ROOF | ACCESSORIES: | - |
| SPARE KVA: | 150 | SPARE PERCENT: | 100% | | | | |

| LOAD DESCRIPTION | CONDUIT SIZE (INCHES) | COND TYPE | (NO. WIRE) SIZE | EGC SIZE | WIRE INSUL TYPE | KAIC | CB AMPS/POLES | POLE # | LOAD AMPS | LOAD AMPS | POLE # | CB AMPS/POLES | KAIC | WIRE INSUL TYPE | EGC SIZE | (NO. WIRE) SIZE | COND TYPE | CONDUIT SIZE (INCHES) | LOAD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EX HRU-1 MODULE A | | | | | | | 15 | 1 | 0.0 | 0.0 | 2 | 20 | | | | | | | HRU-3 MODUE A |
| | | | | | | | | 3 | 0.0 | 0.0 | 4 | | | | | | | | |
| | | | | | | | | 5 | 0.0 | 0.0 | 6 | | | | | | | | |
| EX HRU-1 MODULE B | | | | | | | 20 | 7 | 0.0 | 0.0 | 8 | 20 | | | | | | | HRU-3 MODULE B |
| | | | | | | | | 9 | 0.0 | 0.0 | 10 | | | | | | | | |
| | | | | | | | | 11 | 0.0 | 0.0 | 12 | | | | | | | | |
| EX HRU-2 MODUE A | | | | | | | 25 | 13 | 0.0 | 0.0 | 14 | 20 | | | | | | | HRU-4 MODULE A |
| | | | | | | | | 15 | 0.0 | 0.0 | 16 | | | | | | | | |
| | | | | | | | | 17 | 0.0 | 0.0 | 18 | | | | | | | | |
| EX HRU-2 MODULE B | | | | | | | 25 | 19 | 0.0 | 0.0 | 20 | 20 | | | | | | | HRU-4 MODULE B |
| | | | | | | | | 21 | 0.0 | 0.0 | 22 | | | | | | | | |
| | | | | | | | | 23 | 0.0 | 0.0 | 24 | | | | | | | | |
| SPACE | | | | | | | | 25 | 0.0 | 0.0 | 26 | 25 | | | | | | | HRU-5 MODULE A |
| | | | | | | | | 27 | 0.0 | 0.0 | 28 | | | | | | | | |
| | | | | | | | | 29 | 0.0 | 0.0 | 30 | | | | | | | | |
| SPACE | | | | | | | | 31 | 0.0 | 0.0 | 32 | 25 | | | | | | | HRU-5 MODULE B |
| | | | | | | | | 33 | 0.0 | 0.0 | 34 | | | | | | | | |
| | | | | | | | | 35 | 0.0 | 0.0 | 36 | | | | | | | | |
| SPACE | | | | | | | | 37 | 0.0 | 0.0 | 38 | | | | | | | | SPACE |
| | | | | | | | | 39 | 0.0 | 0.0 | 40 | | | | | | | | |
| | | | | | | | | 41 | 0.0 | 0.0 | 42 | | | | | | | | |

LOAD SUMMARY PANEL

| LOAD CATEGORIES | CONNECTED KVA | DEMAND FACTOR | DEMAND KVA | TOTAL CONNECTED KVA | TOTAL CONNECTED AMPS | DEMAND KVA | DEMAND FACTOR | CONNECTED KVA | LOAD CATEGORIES |
|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | 0.0 | 100% | 0.0 | 0.0 | 0.0 | 0.0 | 90% | 0.0 | MOTOR LOADS |
| RECEPTACLES (1ST 10KVA) | 0.0 | 100% | 0.0 | TOTAL DEMAND KVA | TOTAL DEMAND AMPS | 0.0 | 80% | 0.0 | HVAC |
| RECEPTACLES (BALANCE) | 0.0 | 50% | 0.0 | 0.0 | 0.0 | 0.0 | 70% | 0.0 | MISCELLANEOUS |
| A-PHASE KVA | 0.0 | PANEL SIZING = TOTAL DEMAND KVA X CONTINUOUS LOAD FACTOR X FUTURE LOAD FACTOR | | | | | | 0.0 | A-PHASE AMPS |
| B-PHASE KVA | 0.0 | CONTINUOUS LOAD FACTOR: | | 1.25 | 0.0 | KVA | | 0.0 | B-PHASE AMPS |
| C-PHASE KVA | 0.0 | FUTURE LOAD FACTOR: | | 1.25 | 0.0 | AMPS | | 0.0 | C-PHASE AMPS |

## GENERAL NOTES

1. CONTRACTOR SHALL TRACE OUT AND CONFIRM EXISTING BRANCH CIRCUITS FOR PANELBOARDS WHERE EXISTING BRANCH CIRCUITS ARE RELOCATED TO A NEW PANELBOARD.


Whitman, Requardt & Associates, LLP
801 South Caroline Street, Baltimore, Maryland 21231





ARLINGTON VIRGINIA

DEPARTMENT OF ENVIRONMENTAL SERVICES

Engineering & Capital Projects Division
Engineering Bureau
2100 Clarendon Boulevard, Suite 813
Arlington, VA 22201
Phone: 703.228.3629
Fax: 703.228.3606


Seal

COMMONWEALTH OF VIRGINIA
IL HWAN KIM
Lic. No. 036555
8-7-23
PROFESSIONAL ENGINEER

| Approvals | Date |
|---|---|
| DESIGN TEAM SUPERVISOR | |
| CHIEF ENGINEERING BUREAU | |
| CHIEF WATER, SEWER STREETS BUREAU | |
| DEPARTMENT OF TRANSPORTATION | |

| Revisions | Date |
|---|---|
| | |
| | |
| | |
| | |
| | |

Project Name and Location
ELECTRICAL PANEL REPLACEMENT AT OPERATIONS AND CONTROL BUILDING (OCB)

ELECTRICAL SCHEDULES

Designed: IHK
Drawn: AGT
Checked: IHK
Miss Utility Transmittal #:

Filename: 90258015-E16.dwg
Path: N:\90258-015\CADD\
Plotted: Aug 07, 2023
Plotted by: cwolfe

Scale: NTS

Date: AUGUST 7, 2023

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Sheet
E-16

# COMMONWEALTH of VIRGINIA

**DEPARTMENT OF LABOR AND INDUSTRY**

**Gary G. Pan**
COMMISSIONER

Main Street Centre
600 East Main Street, Suite 207
Richmond, Virginia 23219
PHONE (804) 371-2327
FAX (804) 371-6524


## Virginia Department of Labor and Industry Wage Determination Decision

| | |
|---|---|
| Project Name | Electric Panelboard Replacement |
| County Project Code | 24-DES-ITBPW-432 |
| DOLI Project Number | ARLC-23-0025 |
| County or Independent City | Arlington County |
| Publication Date | 12/18/2023 |
| Construction Type | Building |

| Wage Determinations | Wage | Fringe |
|---|---|---|
| Asbestos Worker/Heat & Frost Insulator (Duct, Pipe & Mechanical System Insulation)* | $39.27 | $18.67 |
| Boilermaker | $42.62 | $24.81 |
| Brick Pointer/Caulker/Cleaner | $19.68 | |
| Bricklayer | $36.50 | $13.47 |
| Carpenter (Includes Acoustical Ceiling Installation, Drywall Hanging, and Form Work) | $23.36 | $5.20 |
| Cement Mason/Concrete Finisher | $21.94 | $3.36 |
| Drywall Finisher/Taper | $26.61 | $11.41 |
| Electrician (Includes Low Voltage Wiring and Installation of Alarms and Sound and Communication Systems) | $53.00 | $21.35 |
| Firestopper** | $29.41 | $8.73 |
| Floor Layer: Soft Floors | $18.75 | |

| Wage Determinations | Wage | Fringe |
|---|---|---|
| Glazier | $30.52 | $13.85 |
| Ironworker | $36.10 | $25.19 |
| Ironworker, Reinforcing | $27.46 | $8.71 |
| Laborer: Common or General, including brick mason tending and cement mason tending | $15.55 | $2.44 |
| Laborer: Pipelayer | $16.81 | $4.26 |
| Marble Finisher | $25.81 | $11.55 |
| Mason - Stone | $43.16 | $20.28 |
| Operator: Backhoe/Excavator/Trackhoe | $23.50 | $4.50 |
| Operator: Bobcat/Skid Steer/Skid Loader | $18.95 | $4.03 |
| Operator: Bulldozer | $21.99 | $4.98 |
| Operator: Crane | $30.45 | $4.14 |
| Operator: Forklift | $21.56 | $7.57 |
| Operator: Loader | $22.26 | $3.57 |
| Operator: Roller | $16.25 | $4.88 |
| Painter (Brush, Roller, and Spray) | $26.61 | $11.41 |
| Pipefitter (Includes HVAC Pipe, Unit and Temperature Controls Installations)*** | $47.98 | $23.12 |
| Plumber**** | $49.00 | $22.21 |
| Roofer | $15.83 | $3.06 |
| Sheet Metal Worker (Includes HVAC Duct Installer)***** | $44.37 | $21.33 |
| Sprinkler Fitter (Fire Sprinklers) | $40.46 | $25.22 |
| Tile Finisher | $23.40 | |
| Tile Setter | $27.80 | $10.25 |
| Truck Driver: Dump Truck | $19.22 | $2.58 |
| Waterproofer | $21.75 | $1.57 |

## Additional Notes

* Asbestos Worker/Heat & Frost Insulator (Duct, Pipe & Mechanical System Insulation) * PAID HOLIDAYS: New Year's Day, Martin Luther King Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, the day after Thanksgiving and Christmas Day provided the employee works the regular work day before and after the paid holiday. *

** Firestopper ** Includes the application of materials or devices within or around penetrations and openings in all rated wall or floor assemblies, in order to prevent the passage of fire, smoke of other gases. The application includes all components involved in creating the rated barrier at perimeter slab edges and exterior cavities, the head of gypsum board or concrete walls, joints between rated wall or floor components, sealing of penetrating items and blank openings. PAID HOLIDAYS: New Year's Day, Martin Luther King Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, the day after Thanksgiving and Christmas Day provided the employee works the regular work day before and after the paid holiday. **

*** Pipefitter (Includes HVAC Pipe, Unit and Temperature Controls Installations) *** PAID HOLIDAYS: New Year's Day, Martin Luther King's Birthday, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day and the day after Thanksgiving and Christmas Day. ***

**** Plumber **** PAID HOLIDAYS: New Year's Day, Martin Luther King's Birthday, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day and the day after Thanksgiving and Christmas Day. ****

***** Sheet Metal Worker (Includes HVAC Duct Installer) ***** PAID HOLIDAYS: New Year's Day, Martin Luther King's Birthday, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day and the day after Thanksgiving and Christmas Day. *****

All wage rates to be used on a contract will be set at the time the contract is awarded. While DOLI maintains a list of wage determinations online for reference purposes, only the wage determinations made in an official Wage Determination Decision, sent by DOLI to the contracting agency, can be used to ascertain the exact rates to be paid for a specific contract.

All rates are determined by DOLI and any appeals of specific classifications may be made through the Wage Determination Appeal form available at http://www.doli.virginia.gov/wp-content/uploads/2021/04/Appeal-for-Wage-Determination-Clarification.pdf

Any additional classifications may be requested through the Additional Wage Classification form available at http://www.doli.virginia.gov/wp-content/uploads/2021/04/Request-for-Additional-Wage-Classification.pdf

Understand your duties as a contractor under Virginia law by referencing our Contractor Responsibilities information sheet available at http://www.doli.virginia.gov/wp-content/uploads/2021/04/PREVAILING-WAGE-CONTRACTOR-RESPONSIBILITIES.pdf

Your employees have specific rights, which can be found on our List of Employee Rights information sheet available at http://www.doli.virginia.gov/wp-content/uploads/2021/04/PREVAILING-WAGE-EMPLOYEE-RIGHTS.pdf
Any further questions should be directed to PrevailingWage@doli.virginia.gov

3. Project Schedule

   Rate the Contractor's performance with regard to adhering to contract schedules. Did the Contractor meet the contract schedule, or the schedule as revised by approved change orders? If not was the delay attributable to the Contractor?

   ____ Unacceptable ____ Poor ____ Satisfactory ____ Excellent ____ N/A

4. Subcontractor Management

   Rate the Contractor's ability, effort and success in managing and coordinating subcontractors (if no subcontractors rate the Contractor's overall project management). Was the Contractor able to effectively resolve problems?

   ____ Unacceptable ____ Poor ____ Satisfactory ____ Excellent ____ N/A

5. Safety

   Rate the Contractor's safety procedures on this Contract/Project? Were there any OHSA violations or serious safety accidents?

   ____ Unacceptable ____ Poor ____ Satisfactory ____ Excellent ____ N/A

6. Environmental Compliance

   Did the Contractor comply with local, state, and federal environmental standards in the performance of the Contract? Did the Contractor comply in good faith with local erosion and sedimentation control requirements and/or any Stormwater Pollution Prevention Plan?

   ____ Unacceptable ____ Poor ____ Satisfactory ____ Excellent ____ N/A

7. Change Orders

   Did the Contractor unreasonably claim change orders or extras? Were the Contractor's prices on change orders and extra work reasonable?

   ____ Unacceptable ____ Poor ____ Satisfactory ____ Excellent ____ N/A

8. Paperwork Processing

   Rate this Contractor's performance in completing and submitting required project paperwork (i.e. change orders, submittal, drawings, invoices, workforce reports, etc.) Did the Contractor submit the required paperwork promptly and in proper form?

   ____ Unacceptable ____ Poor ____ Satisfactory ____ Excellent ____ N/A

9. Supervisory Personnel

   Rate the general performance of this Contractor's supervisory personnel. Did they have the knowledge,

management skills and experience to run a project of this size and scope?

____ Unacceptable ____ Poor ____ Satisfactory ____ Excellent ____ N/A

10. Expertise, Knowledge and Experience

    Rate this Contractor's personnel. Were they dedicated, experienced and qualified for the duration of project.

____ Unacceptable ____ Poor ____ Satisfactory ____ Excellent ____ N/A

11. Project/Contract Closeout

    Rate the Contractor's performance on timeliness and quality of closeout deliverables such as As-Built Drawings, Operation and Maintenance Manuals, and training. Did the Contractor complete the tasks or Project on schedule; was the punch list completed within the allotted time?

____ Unacceptable ____ Poor ____ Satisfactory ____ Excellent ____ N/A

12. Level of Overall Performance

____ Unacceptable ____ Poor ____ Satisfactory ____ Excellent ____ N/A

Based on these comments, would you recommend this Contractor for comparable work in the future?

☐ Yes ☐ No

Please provide any comments regarding the Contractor's performance or the quality of its work. The Contractor can also provide any comments or clarification on the evaluation in the box below.

(Project Officer or Contractor, use additional sheets, if Necessary):

Signatures and Certifications:

1. The information contained in this evaluation form represents, to the best of my knowledge, a true and accurate analysis of the Contractor's performance record on this Contract; and,
2. The contents on the evaluation form and the ratings were not negotiated with the Contractor or its representative for any reason.

Evaluator's Signature:_____ Date: _____

Evaluator's (PjO) Printed Name_____ Evaluator's Title: _____

Contractor's signature below acknowledges receipt and the opportunity to respond:

Contractor Signature:_____ Date: _____

Contractor Printed Name:_____ Title: _____

## EVALUATION RATINGS DEFINITIONS

| Rating | Definition | Notes |
|---|---|---|
| Excellent | Performance meets contractual requirements and exceeds many to the County's benefit. The contractual performance of the element or sub-element being evaluated was accomplished with few minor problems for which corrective actions taken by the contractor were highly effective. | To justify an Exceptional rating, identify multiple significant events and state how they were of benefit to the County. A singular benefit, however, could be of such magnitude that it alone constitutes an Exceptional rating. Also, there should have been NO significant weaknesses identified. |
| Satisfactory | Performance meets contractual requirements. The contractual performance of the element or sub-element contains some minor problems for which corrective actions taken by the contractor appear or were satisfactory. | To justify a Satisfactory rating, there should have been only minor problems, or major problems the contractor recovered from without impact to the contract/order. There should have been NO significant weaknesses identified. A fundamental principle of assigning ratings is that contractors will not be evaluated with a rating lower than Satisfactory solely for not performing beyond the requirements of the contract/order. |
| Poor | Performance does not meet some contractual requirements. The contractual performance of the element or sub-element being evaluated reflects a serious problem for which the contractor has not yet identified corrective actions. The contractor's proposed actions appear only marginally effective or were not fully implemented. | To justify poor performance, identify a significant event in each category that the contractor had trouble overcoming and state how it impacted the County. A poor rating should be supported by referencing the management tool that notified the contractor of the contractual deficiency (e.g., management, quality, safety, or environmental deficiency report or letter). |

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| Unacceptable | Performance does not meet most contractual requirements and recovery is not likely in a timely manner. The contractual performance of the element or sub-element contains a serious problem(s) for which the contractor's corrective actions appear or were ineffective. | To justify an Unsatisfactory rating, identify multiple significant events in each category that the contractor had trouble overcoming and state how it impacted the County. A singular problem, however, could be of such serious magnitude that it alone constitutes an unsatisfactory rating. An Unsatisfactory rating should be supported by referencing the management tools used to notify the contractor of the contractual deficiencies (e.g., management, quality, safety, or environmental deficiency reports, or letters). |
| Not Applicable (N/A) | N/A (not applicable) should be used if the ratings are not going to be applied to a particular area for evaluation. | |

END