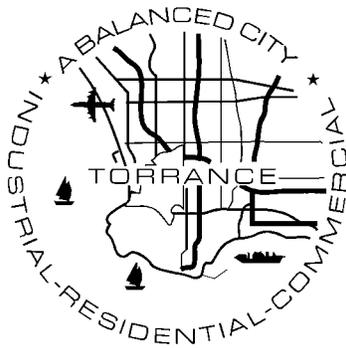


**PROJECT MANUAL FOR ELECTRICAL FOR
TRANSIT BUS WASH EQUIPMENT
B 2014-13**



JANUARY 2014

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PART A

NOTICE INVITING BIDS

**CITY OF TORRANCE
CALIFORNIA**

NOTICE INVITING BIDS

Notice is hereby given that sealed proposals for performing the following described work will be received at the office of the City Clerk of the City of Torrance, California, until **3:00 p.m. on Wednesday, March 12, 2014** after which time they will be publicly opened and read at 3:15 p.m. in the Council Chambers of said City:

**Bid for Electrical for Transit Bus Wash Equipment
B2014-13**

Plans, Bid Proposal (for reference only) and Specifications are available for viewing and printing from the City's website at <http://www.torranceca.gov/25079.htm>.

There will be a mandatory pre-bid conference held on Thursday, February 13, 2014 at 10:00 a.m. commencing at the Torrance Transit Department located at 20500 Madrona Avenue, Torrance, CA 90503. The City of Torrance will consider the bidder as non-responsive if the bidder does not attend the mandatory pre-bid conference. **Addenda will be issued only by email and only to those attended the mandatory pre-bid conference.** All addenda must be acknowledged. Failure to acknowledge addenda on the bid forms provided may render the proposal non-responsive and cause it to be rejected.

Full-size 24" x 36" set of Plans and a bound Specifications booklet may also be obtained at the Office of the City Clerk (310) 618-2870, City Hall, 3031 Torrance Boulevard, Torrance, California upon payment of \$35 if picked up at City Hall, or payment of \$45 if requested by mail. Both amounts are non-refundable.

If requesting any item(s) by mail, please send check to the following:

**CITY OF TORRANCE
OFFICE OF THE CITY CLERK
3031 TORRANCE BLVD
TORRANCE, CA 90503-2970
ATTN: B2014-13**

The engineer's estimate is \$65,000 – 75,000. The work shall be completed within forty five (45) calendar days of receipt of the Notice to Proceed (NTP). Onsite work no more than 14 consecutive calendar days. Bids are required for the entire work described herein.

The City has determined the bidder must have a valid "C-10" Electrical Contracting License. Bidder must have at least five (5) years experience in public works projects of a similar size and scope.

Per Division 2, Chapter 2 of the Torrance Municipal Code, the Torrance City Council may reject any and all bids, waive any informality or irregularity in such bids, and determine the lowest responsible bidder.

No Facsimile Bids shall be accepted by the City.

Non-prevailing wage project.

By order of the City Council of the City of Torrance, California.

Bidders with pre-bid inquiries should contact Diane Megerdichian, Sr. Business Manager, General Services Department at 310-781-7151 or email dmegerdichian@torranceca.gov. If emailing questions, please put project title in the subject line.

PART B
INSTRUCTIONS TO BIDDERS

**CITY OF TORRANCE
CALIFORNIA**

INSTRUCTIONS TO BIDDERS

A. QUALIFICATION OF BIDDERS

1. Competency of Bidders

The Bidder shall be thoroughly competent and capable of satisfactorily performing the Work covered by the Bid. As specified in the Bid Documents, the Bidder shall furnish statements of previous experience on similar work. When requested, the Bidder shall also furnish a plan of procedure proposed; organization, machinery, plant and other equipment available for the Work; evidence of financial condition and resources; and any other documentation as may be required by the City to determine if the Bidder is responsible.

2. Contractor's License

At the time of submitting the Bid, the Bidder shall be licensed as a contractor in accordance with the provisions of Chapter 9, Division 3, of the California Business and Professions Code. The required prime contractor license class for the Work is shown in the project Notice Inviting Bids. However, the City reserves the right to award the Contract to a contractor with another class if the City determines that the license is proper for the work.

B. BIDDER RESPONSIBILITY

A responsible Bidder is a Bidder who has demonstrated the attribute of trustworthiness, as well as ability, fitness, capacity and experience to satisfactorily perform the work.

Bidders are notified that, in accordance with Division 2, Chapter 2 of the Torrance Municipal Code, the City Council may determine whether the Bidder is responsible based on a review of the Bidder's performance on other contracts.

If, based on the provision and criteria in Division 2, Chapter 2 of the Torrance Municipal Code, the General Services Director proposes not to recommend the award of contract to the apparent low bidder, the Director shall notify the Bidder in writing of its intention to recommend to the City Council that the Council award the contract to the next lowest responsible bidder. If the Bidder presents evidence in rebuttal to the recommendation, the Director shall evaluate the merits of such evidence, and based on that evaluation, make a recommendation to the City Council.

C. ADDENDA TO THE CONTRACT DOCUMENTS

The City reserves the right to revise or amend these specifications prior to the date set for opening bids. Revisions and amendments, if any, will be announced by an addendum to this bid. If the revisions require additional time to enable Bidders to respond, the City may postpone the opening date accordingly. In such case, the addendum will include an announcement of the new opening date.

All addenda must be attached to the bid. Failure to attach any addendum may render the bid non-responsive and cause it to be rejected.

D. PREPARATION OF THE BID

1. Examination of Site, Plans and Specifications

Bidders shall examine the site of the work and acquaint themselves with all conditions affecting the work. By submitting a bid, the bidder shall be held to have personally examined the site and the drawings, to have carefully read the specifications, and to have satisfied itself as to its ability to meet all the difficulties attending the execution of the proposed contract before the delivery of this proposal, and agrees that if awarded the contract, will make no claim against the City based on ignorance or misunderstanding of the plans, specifications, site conditions and/or contract provisions.

The Contractor shall have included in the contract price a sufficient sum to cover all items, including labor, materials, tools, equipment and incidentals, that are implied or required for the complete improvements as contemplated by the drawings, specifications, and other contract documents.

2. Bid Instructions and Submissions

The Bid shall be submitted on the Bid Proposal forms included in the Specifications. All Bid Documents must be completed, executed and submitted with Bid by Bidder. Required seven (7) Bid Proposal Documents:

1. Bidder's Proposal
2. Addenda Acknowledgment
3. Contractor's Affidavit
4. Bid Bond (10% of Bid)
5. List of Subcontractors
6. Bidder's References/Experience (2 pages)
7. Bidder's Information (2 pages)

All prices submitted will be considered as including any and all sales or use taxes.

E. BID FORM/BOND

The Bid must be accompanied by cash, a certified or cashier's check, or a surety bond (bid bond) payable to the City of Torrance. Bids must be submitted on the proposal forms furnished by the City Clerk's office. The Bid Guaranty shall be in an amount equivalent to at least 10% of the Total Contract Bid Price.

Within ten (10) days after the award of the contract, the City Clerk will return the proposal guarantees accompanying those proposals, which are not to be considered in making the award. All other proposal guarantees will be held until the contract has been finally executed, after which they will be returned to the respective bidders whose proposals they accompany.

F. AFFIDAVIT.

An affidavit form is enclosed. It must be completed signifying that the bid is genuine and not collusive or made in the interest or on behalf of any person not named in the bid, that the bid has not directly or indirectly induced or solicited any other Bidder to put in a sham bid or any other person, firm, or corporation to refrain from bidding, and that the Bidder has not in any manner sought by collusion to secure for itself an advantage over any other Bidder. Any bid submitted without an affidavit or in violation of this requirement will be rejected.

G. NONRESPONSIVE BIDS AND BID REJECTION

1. A Bid in which any one (1) of the required eight (8) Bid proposal documents are not completed, executed and submitted may be considered non-responsive and be rejected.
2. A Bid in which the Contract Unit Prices are unbalanced, which is incomplete or which shows alteration of form or irregularities of any kind, or which contains any additions or conditional or alternate Bids that are not called for, may be considered non-responsive and be rejected.

H. AWARD OF CONTRACT

In accordance with Division 2, Chapter 2 of the Torrance Municipal Code, the City Council reserves the right to reject any and all bids received, to take all bids under advisement for a period not-to-exceed sixty (60) days after date of opening thereof, to waive any informality or irregularity in the Bid, and to be the sole judge of the merits of material included in the respective bids received. This bid does not commit the City to award a contract or to pay any cost incurred in the preparation of a bid. All responses to this bid become the property of the City of Torrance.

I. EXECUTION OF CONTRACT

After the Contract is awarded, the awarded bidder shall execute the following six (6) documents:

1. Performance Bond (100% of Bid)
2. Labor and Material Bond (100% of Bid)
3. Contract - Public Works Agreement
4. Verification of Insurance Coverage (Certificates and Endorsements)
5. Workers' Compensation Insurance Certificate
6. Business License Application Form

J. PERMITS, LICENSES AND PUBLIC WORKS AGREEMENT

The Contractor shall procure and execute all permits, licenses, pay all charges and fees, and give all notices necessary and incidental to completion of Work. The Contractor shall execute a Public Works Agreement. No fee is charged for a permits issued by the City of Torrance Building and Safety Department for a public works project. The Contractor shall obtain a City of Torrance Business License. To obtain a Torrance Business License please call 310-618-5923.

K. INSURANCE

The Contractor shall maintain Automobile Liability, General Liability and Workers' Compensation Insurance as specified in the Public Works Agreement included in the Project Specifications. The contractor must include all subcontractors as insured under its policies or must furnish separate certificates and endorsements for each subcontractor. All coverage for subcontractors will be subject to all of the insurance requirements.

L. SUBCONTRACTS

Each Bidder shall comply with the Chapter of the Public Contract Code including sections 4100 through 4113. The Contractor shall perform, with its own organization, Contract work amounting to at least 50 percent of the Contract price. When a portion of an item is subcontracted, the value of the work subcontracted will be based on the estimated percentage of the Contract Unit Price, determined from information submitted by the Contractor, subject to approval by the City Manager.

M. TRAFFIC CONTROL PLAN

Not applicable

N. PRE-BID INQUIRIES

Bidders with pre-bid inquiries should contact Diane Megerdichian, Sr. Business Manager, General Services Department at 310-781-7151 or email dmegerdichian@torranceca.gov. If emailing, please put project title in the subject line.

DO NOT RETURN PLANS AND SPECIFICATIONS.

ALL BIDS MUST BE SEALED AND MARKED:

"BID FOR ELECTRICAL FOR TRANSIT BUS WASH EQUIPMENT, B2014-13 "

O. EXECUTION OF CONTRACT

1. The contract shall be signed by the successful bidder and returned, together with the contract bonds and evidence of required insurance coverage, **within ten (10) working days**, not including Sundays, after the bidder has received notice that the contract has been awarded. Failure to execute the contract as specified above shall be just cause for annulment of the award and forfeiture of the proposal

guarantee. The Contract shall not be considered binding upon the CITY until executed by the authorized CITY officials.

2. Bond amounts shall be as provided in Section 2-4 of the Standard Specifications for Public Works Construction. The Performance Bond shall be required to remain in effect for one (1) year following the date specified in the City's Notice of Completion, or, if no Notice of Completion is recorded for one (1) year following the date of final acceptance by the City Manager.

P. **INSURANCE REQUIREMENTS FOR CONTRACTORS.**

Please refer to the attached Public Works Agreement for insurance requirements.

Q. **RESPONSIBILITY OF CITY.**

The City of Torrance shall not be held responsible for the care or protection of any material or parts of the work prior to final acceptance, except as expressly provided in these specifications.

R. **CONSTRUCTION SCHEDULE AND PRECONSTRUCTION CONFERENCE.**

The office staff of the City is currently operating on a 9/80 work week; therefore, City Hall is closed every other Friday.

In accordance with the herein Special Provisions, after notification of award and prior to start of any work, **the Contractor shall submit to the City Manager for approval its proposed Construction Schedule within ten (10) working days from the date of Notice of Proceed.** At least two (2) days, exclusive of Saturdays, Sundays and holidays, prior to commencement of work, the Contractor shall attend a pre-construction conference.

The Contractor will provide all product and equipment submittals to the City of Torrance or designated consultant within ten (10) working days from the date of Notice to Proceed. The Contractor shall immediately order materials requiring a delivery delay upon receipt of a written notice from the City that the City Council has approved an Award of Contract. Contractor shall provide written proof(s) of timely material order(s) and shall include any delivery delays in the Construction Schedule.

S. **PROGRESS OF THE WORK AND TIME FOR COMPLETION**

The Contractor shall begin work after the mailing, from the City Manager to the Contractor, by first class mail, postage prepaid, of a Notice to Proceed. **The Contractor shall diligently prosecute the same to completion within forty-five (45) calendar days of the start date specified in said Notice.** The forty-five calendar day schedule includes, completion of contractual paper work, equipment/ material submittal review, the lead time for materials and equipment, and on site work. Onsite work will be no more than 14 consecutive calendar days.

During periods when weather or other conditions are unfavorable for construction, the Contractor shall pursue only such portions of the work as shall not be damaged thereby.

No portions of the work whose acceptable quality or efficiency will be affected by any unfavorable conditions shall be constructed while those conditions exist. It is expressly understood and agreed by and between the Contractor and the City that the Contract time for completion of the work described herein is a reasonable time taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the work.

T. LIQUIDATED DAMAGES

The Contractor agrees that failure to complete work within the time allowed will result in damages being sustained by the City. Contractor and City agree that failure to complete the project will result in inconvenience to the citizens of Torrance and the City of Torrance and their customers using the affected areas. Such delay will also result in the necessity of several inspections each day to ensure that the project is properly progressing. The parties also agree that failure to complete the project on time will prevent the City from having the use of the facility. Therefore, the parties agree such damages among others are, and will continue to be, impracticable and extremely difficult to determine, but that five hundred dollars (\$500) a calendar day is the minimum value of such costs to the City and is a reasonable amount that the Contractor agrees to reimburse the City for each calendar day of delay in finishing the work in excess of the time specified for completion, plus any authorized time extensions.

Execution of the contract under these specifications shall constitute agreement by the Contractor and the City that Seven Hundred and Fifty Dollars (\$750) per calendar day is the minimum value of the costs and actual damage caused by failure of the Contractor to complete the work within the allotted time, that such sum is liquidated damages and shall not be construed as a penalty, and that such sum may be deducted from payments due the Contractor if such delay occurs. Said amount may be reduced by the City if work is sufficiently completed within the allotted time so that the damages are minimized.

The Contractor will not be assessed liquidated damages for any delay in completion of the work when such delay was caused by the failure of the City or the owner of a utility to provide for removal or relocation of the existing utility facilities; provided, however, that the Contractor shall have given the City and the owner of a utility timely notice of the interference. "Timely notice" shall be defined as a verbal notice (to be followed up in writing) no later than one (1) hour after initial discovery of the interference unless the City Representative is present, in which case notice shall be given immediately in writing to the City Manager.

U. GENERAL PREVAILING WAGE RATE

Not applicable.

V. PRELIMINARY NOTICES

Preliminary Notices should be mailed to the following address.

Diane Megerdichian
General Services Department
3350 Civic Center Drive

Torrance, CA 90503

W. NOTICE OF INTENT TO AWARD:

Approximately two (2) weeks prior to the anticipated City Council meeting awarding a contract/purchase order as a result of this Notice Inviting Bids, the City will notify all bidder's of its intent to award. Results will be posted on the City of Torrance Web site http://www.torranceca.gov/PDF/Recommendation_to_Award_Notification.pdf

X. BID/RFP PROTEST PROCEDURES:

The City of Torrance Bid/RFP Protest Procedures may be found on the City of Torrance Web site: http://www.torranceca.gov/PDF/Bid_RFP_Protest_Procedures.pdf

PART B

GENERAL PROVISIONS

**CITY OF TORRANCE, CALIFORNIA
B. General Provisions**

**Bid for Electrical for Transit Bus Wash Equipment
B 2014-13**

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DIVISION I. PROJECT SPECIFICATIONS

SECTION A. GENERAL

The Project Specifications for all work on this project are the specifications contained in the **“Project Manual for Electrical for Transit Bus Wash Equipment”**, prepared by Breen Engineering and the City of Torrance.

These Specifications are intended to govern all aspects of the appurtenant construction including, but not limited to, materials, methods and details, except as modified herein or as inconsistent with the provisions hereof.

DEFINITIONS

Whenever the following terms are used, they shall be understood to mean and refer to the following:

Agency or City - City of Torrance.

Board- The City Council of the City of Torrance herein referred to as City Council.

City Manager - The City Manager of the City of Torrance, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

Consulting Architect – Cliff van Kullenburg
Breen Engineering
1983 West 190th Street, Suite 200
Torrance, CA 90504
Office: 310-464-8404
Fax: 310-464-8408
cvk@breeneng.com

Laboratory - The designated laboratory authorized by the City of Torrance to test materials and work involved in the contract.

SECTION B. REFERENCE TO STANDARDS OR PUBLICATIONS

Any reference made in the Contract Documents to any specification, standard, or publication of any organization shall, in the absence of a specific designation to the contrary, be understood to refer to the latest edition of the specification, standard, or publication in effect as of the date of advertising the work, except to the extent that said standard or publication may be in conflict

with applicable laws, ordinances, or governing codes. Contractors should be aware of all new code requirements (such as Cal-Green) when dealing with HVAC and other general building work. No requirements of these specifications or the drawings shall be waived because of any provisions of, or omission from, said standards or publications.

DIVISION II. SPECIAL PROVISIONS

SECTION A. DESCRIPTION OF THE WORK

1. Scope of the Work. The work to be done consists of furnishing all labor, materials, tools, equipment and incidentals to complete the electrical for the Transit Bus Wash Equipment as shown in the plans and specifications prepared by Breen Engineering for the City of Torrance.

SECTION B. GENERAL PROCEDURES

1. Specifications and Drawings Complementary. The Specifications and Drawings are complementary, and what is called for in one shall be as binding as if called for in both.
2. Order of Precedence of Contract Documents. In resolving conflicts resulting from conflicts, errors, or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:
 - a. Change Orders (Including Plans and Specifications attached thereto).
 - b. Public Works Agreement
 - c. Addenda
 - d. Special Provisions
 - e. Plans
 - f. Standard Plans
 - g. Instructions to Bidders
 - h. Standard Specifications

Within the Specifications the order of precedence is as follows:

- a. Addenda/Change Orders
- b. Permits from other agencies/supplemental agreements
- c. Special Provisions
- d. Instructions to Bidders
- e. Referenced Standard Drawings
- f. Referenced Standard Specifications

With reference to the Drawings the order of precedence is as follows:

- a. Change Orders drawings govern over Addenda and Contract Drawings
- b. Addenda drawings govern over Contract drawings
- c. Contract drawings govern over shop drawings and standard drawings
- d. Detail drawings govern over general drawings
- e. Figures govern over scaled dimensions

If the Contractor, in the course of the Work, becomes aware of any claimed errors or omissions in the Contract Documents or in the CITY's fieldwork, the Contractor shall immediately inform the CITY. The CITY shall promptly review the matter, and if the CITY finds an error or omission has been made the CITY shall determine the corrective actions and advise the Contractor accordingly. If the corrective work associated with an error or omission increases or decreases the amount of work called for in the Contract, the CITY shall issue an appropriate Change Order in accordance with 3-3. After discovery of an error or omission by the Contractor, any related work performed by the Contractor shall be done at the Contractor's risk unless authorized by the CITY.

3. Discrepancies in the Contract Documents. Any discrepancies, conflicts, errors or omissions found in the Contract Documents shall be promptly reported in writing to the City Manager, who will issue a correction in writing. The Contractor shall not take advantage of any such discrepancies, conflicts, errors or omissions, but shall comply with any corrective measures regarding the same prescribed by the City Manager, and no additional payment or time shall be allowed therefor.

If discrepancies are discovered between the drawings and the specifications, and no specific interpretation is issued prior to bidding, the decision regarding this interpretation shall rest with the City Manager. The Contractor shall be compelled to act on the City Manager's decision as directed. In the event the installation is not in compliance with the direction of the City Manager, the installation shall be corrected by and at the expense of the Contractor at no additional cost to the City.

See Section C of these Special Provisions for "Claims".

4. Errors and Omissions. If the Contractor, in the course of the work, becomes aware of any claimed errors or omissions in the contract documents or in the City's field work, he shall immediately inform the City Manager. The City Manager shall promptly review the matter, and if the City Manager finds an error or omission has been made the City Manager shall determine the corrective actions and advise the Contractor accordingly. If the corrective work associated with an error or omission increases or decreases the amount of work called for in the Contract, the City shall issue an appropriate Change Order. After discovery of an error or omission by the Contractor, any related work performed by the Contractor shall be done at its risk unless authorized by the City Manager.
5. Changed Conditions. The plans for the work show conditions as they are believed by the City Manager to exist, but it is not intended or to be inferred that the conditions as shown thereon constitute a representation by the City that such conditions are actually existent, nor shall the City be liable for any loss sustained by the Contractor as a result of any variance of the conditions as shown on the plans and the actual conditions revealed during the progress of the work or otherwise. The word "conditions" as used in this paragraph includes, but is not limited to, site conditions, both surface and subsurface.

The Contractor shall examine the site, compare it with the drawings and specifications and shall satisfy itself as to the conditions under which the work is to be performed. The Contractor shall ascertain and check the location of all existing structures, utilities and equipment, which may affect its work. The Contractor shall be responsible to re-examine the site, as necessary, for performance of change orders or other proposed changes, which may affect its work. No allowance shall subsequently be made on the Contractor's behalf for any extra expense or loss of time, which is incurred due to failure or negligence on its part to make such examination.

6. As-built Drawings. The Contractor shall maintain a control set of Plans and Specifications on the Work site at all times. All final locations determined in the field, and any deviations from the Plans and Specifications, shall be marked in red on this control set to show as-built conditions. Upon completion of the Work, the Contractor shall submit the control set to the Engineer for approval. Final payment will not be made until this requirement is met.

7. Construction Staking. The Contractor is responsible for all construction staking and shall be responsible for the cost of any restaking required due to disturbance caused by its operations, failure to protect the work site from vandalism or other causes of loss.
8. Notice to Proceed. Notwithstanding any other provisions of the Contract, the Contractor shall not be obligated to perform any work and the City shall not be obligated to accept or pay for any work performed by the Contractor prior to delivery of a Notice to Proceed. The City's knowledge of work being performed prior to delivery of the Notice to Proceed shall not obligate the City to accept or pay for such work. The Contractor shall provide all required contract bonds and evidences of insurance prior to commencing work at the site.
9. Delay in Obtaining Materials. No extension of time will be granted for a delay caused by the inability to obtain materials unless the Contractor either obtains advance written approval from the City Manager or obtains from the supplier and furnishes to the City Manager documentary proof that such materials could not be obtained due to war, government regulations, labor disputes, strikes, fires, floods, adverse weather necessitating the cessation of work, or other similar action of the elements. The Contractor is required to order materials in a timely manner as specified in the "Instruction to Bidders".
10. Inspection and Testing. The Work is subject to inspection and approval by the CITY. The Contractor shall notify the CITY a minimum of 48 hours in advance of the required inspection.

The CITY will make, or have made, such inspections and tests, as he deems necessary to see that the Work is in conformance with the Contract Documents. In the event such inspections or tests reveal noncompliance with the Contract Documents, the Contractor shall bear the cost of such corrective measures as deemed necessary by the CITY, as well as the cost of subsequent re-inspection and re-testing.

Work done in the absence of inspection by the CITY may be required to be removed and replaced under the inspection of the CITY, and the entire cost of removal and replacement, including the cost of all materials which may be furnished by the CITY and used in the work thus removed, shall be borne by the Contractor, regardless of whether the work removed is found to be defective or not. Work covered without the approval of the CITY shall, if so directed, be uncovered to the extent required by the CITY, and the Contractor shall similarly bear the entire cost of performing all the work and furnishing all the materials necessary for the removal of the covering and its subsequent replacement, including all costs for additional inspection.

The CITY and any authorized representatives shall at all times have access to the Work during its construction at shops and yards as well as the Work site. The Contractor shall provide every reasonable facility for ascertaining that the materials and workmanship are in accordance with the Contract Documents.

Inspection of the Work shall not relieve the Contractor of the obligation to fulfill all conditions of the Contract.

11. Project Schedule

12.1 The Contractor shall submit a Construction Schedule in accordance with the project manual to the City Manager prior to beginning construction. No work may be started until the Schedule has been approved in writing. The work shall be scheduled to assure that construction will be completed within the specified time. The Contractor shall be responsible for coordination of all phases of the operation so that the time schedule can be met.

12.2 If the Contractor desires to make a major change in its method or operations after commencing construction or if their Schedule fails to reflect the actual progress, the Contractor shall submit to the City Manager a revised Construction Schedule in advance of beginning revised operations.

12. Mobilization

13.1 Scope. Mobilization shall include the provision of the Construction Schedule; site review; obtaining all permits, insurance, and bonds; moving onto the site all plant and equipment; furnishing and erecting plants, temporary buildings, and other construction facilities, and removal of same at completion of the project; all as required for the proper performance and completion of the work.

Mobilization shall include, but not be limited to, the following principle items.

- (a) Submittal and modification, as required, of the Construction Schedule.
- (b) All associated documentation and submittals required by Exhibit A of the contract.
- (c) Installing temporary construction power and wiring.
- (d) Establishing fire protection system.
- (e) Developing construction water supply.
- (f) Providing on-site sanitary facilities and portable water facilities, as required.
- (g) Arranging for and erection of Contractor's work and storage yard.
- (h) Submittal of all required insurance certificates and bonds, including subcontractors.
- (i) Obtaining all required permits.

- (j) Posting all OSHA required notices and establishment of safety programs.
- (k) Have the Contractor's superintendent at the job site full-time.
- (l) Pot-holing and other research and review as necessary to verify site conditions and utility locations, including research and review as necessary for change orders.
- (m) Demobilization.

13. Markup. The following percentages shall apply for additional work:

Profit	5% maximum
Overhead	5% maximum

The markups mentioned hereinafter shall include, but are not limited to, all costs for the services of superintendents, project managers, timekeepers and other personnel not working directly on the change order, and pickup or yard trucks used by the above personnel, and other vehicles and/or equipment present at the jobsite but not directly used in actual construction activities. Incidental movements of labor, materials, supplies or equipment shall not be considered as use in actual construction activities. These costs shall not be reported as labor or equipment elsewhere, except when actually performing work directly on the change order and then shall only be reported at the labor classification of the work performed.

The City shall not pay for the cost of foremen or a superintendent unless authorized in advance by the City Manager. To the sum of the costs and markups provided for in this subsection, one (1) percent shall be added as compensation for bonding.

14. Utilities

The Contractor shall provide coordination with all the utility companies involved and shall provide protection from damage to their facilities. The Contractor shall be responsible for repair or replacement to said facilities made necessary by its failure to provide required protection. The Contractor is required to include utility requirements in the Construction Schedule.

The Contractor shall be solely responsible to check all utility record maps, books, and/or other data in the possession of the CITY, other agencies, and/or all utility companies, and no allowance shall be made for any failure to have done so.

The Contractor shall utilize the services of "Underground Service Alert - Southern California" for utility locating in all public right-of-ways by calling 1-800-227-2600 at least 48 hours prior to any excavation.

15. Completion, Acceptance and Warranty

If, in the CITY's judgment, the Work has been completed and is ready for acceptance, the CITY will so certify and will determine the date when the Work was completed. This will be the date when the Contractor is relieved from responsibility to protect the Work.

The CITY may cause a Notice of Completion to be filed and recorded with the Los Angeles County Recorder's Office. At the CITY's option, the CITY may certify acceptance to the City Council who may then cause a Notice of Completion to be filed and recorded with the Los Angeles County Recorder's Office.

Manufacturer's warranties and guaranties furnished for materials used in the Work and instruction sheets and parts listed supplied with materials shall be delivered to the CITY prior to acceptance of the Work.

The duration of the warranty or guaranty shall be the standard of the industry with a minimum of 1 year from the date of Notice of Completion or Date of Acceptance. The prime contractor will be required to warranty the entire project regardless of whether warranties from subcontractors are also required. Coordination and correction of any issue related to project scope that arises during that one (1) year warranty period will be the responsibility of the prime contractor.

Manufacturer's warranties shall not relieve the Contractor of liability under these Specifications. Such warranties only shall supplement the Contractor's responsibility.

The CITY may require a manufacturer's warranty on any product offered for use.

16. Contractor's Representative

The Contractor's Representative shall be approved by the CITY prior to the start of the Work. If the designated representative is rejected, the Contractor shall immediately designate another representative in writing and submit to the City for consideration. The CITY shall have the authority to require the Contractor to remove its representative and/or alternate representative at any time and at no cost to the CITY.

17. Requirements for Recycling Construction Materials

The City of Torrance requires that all demolition projects and construction or remodeling projects valued at \$100,000 or more must recycle or reuse at least 50% of the materials that leave the project site and 100% of excavated soil and land-clearing debris. A Waste Management Plan (WMP) form is part of the permit process for projects that meet these criteria. The WMP form is available at the permit counter or a downloadable form is available here:

<http://www.torranceca.gov/PDF/WMPFormRevised2012onestop.pdf>

Step 1 - when applying for the permit, you must complete the WMP form stating that at least 50% of the waste generated by the project will be recycled or reused and that 100% of excavated soil and land-clearing debris will be recycled or reused.

Step 2 - collect and keep all receipts and records of the disposal, recycling, donations, and reuse of the materials from your project. Receipts must show material type, tonnage or weight, how the materials were treated, the facility used, and the address of the jobsite.

Step 3 - complete the WMP by attaching the receipts listing the actual disposal and recycling that occurred and submitting the WMP to Public Works for approval. This is required before your project can get its final inspection.

Failure to fulfill the requirements of the WMP process will result in penalties of \$5,000 for construction projects and \$10,000 for demolition projects, as per the Torrance Municipal Code.

For additional information concerning recycling or recycling facilities please visit the City of Torrance Public Works Department website at <http://www.torranceca.gov/8614.htm>

SECTION C. PAYMENTS TO CONTRACTOR AND CLAIMS

1. Breakdown of Contract Prices. The Contractor shall, within ten (10) working days of receipt of a request from the City, submit a complete breakdown of lump sum bid prices showing the value assigned to each part of the work, including an allowance for profit and overhead. In submitting the breakdown, the Contractor certifies that it is not unbalanced and that the value assigned to each part of the work represents its estimate of the actual cost, including profit and overhead, of performing that part of the work. The breakdown shall be sufficiently detailed to permit its use by the City Manager as one of the bases for evaluating requests for payment. No extra costs shall be allowed for these breakdowns.
2. Payment for Labor and Materials. The Contractor shall pay and cause the subcontractors to pay any and all accounts for labor, including Worker's Compensation premiums, State Unemployment and Federal Social Security payments and all other wage and salary deductions required by law. The Contractor also shall pay and cause the subcontractors to pay any and all accounts for services, equipment and materials used by it and the subcontractors during the performance of work under this contract. All such accounts shall be paid as they become due and payable. If requested by the City Manager, the Contractor shall immediately furnish the City with proof of payment of such accounts. Please see Exhibit A of the Public Works Agreement for further contract requirements.
3. Additional Work. Payment for additional work and all expenditures in excess of the bid amount must be authorized in writing by the City Manager. Such authorization shall be obtained by the Contractor prior to engaging in additional work. It shall be the Contractor's sole responsibility to obtain written approval from the City Manager for any change(s) in material or in the work proposed by suppliers or subcontractors. No payment shall be made to the Contractor for additional work which has not been approved in writing, and the Contractor hereby agrees that it shall have no right to additional compensation for any work not so authorized.
4. Claims. The Contractor shall not be entitled to the payment of any additional compensation for any cause, including any act, or failure to act, by the City, or the happening of any event, thing or occurrence, unless he shall have given the City due written notice of potential claim as hereinafter specified.

The written notice of potential claim shall set forth the reasons for which the Contractor believes additional compensation will or may be due, the nature of the costs involved, and, insofar as possible, the amount of the potential claim. Said notice shall be submitted on a form approved by the City at least forty-eight (48) hours (two working days) in advance of performing said work, unless the work is of an emergency nature, in which case the

Contractor shall notify and obtain approval from the Inspector prior to commencing the work. The City Manager may require the Contractor to delay construction involving the claim, but no other work shall be delayed, and the Contractor shall not be allowed additional costs for any said delay but may be allowed on extension of time if the City Manager agrees that the work delayed is a controlling element of the Construction Schedule. The Contractor shall be required to submit any supporting data (or a detailed written explanation justifying further delay) within five (5) Work Days of a request from the City Manager and shall be responsible for any delays resulting from late and/or incomplete submittals. By submitting a Bid, the Contractor hereby agrees that this Section shall supersede Sections 6-6.3 and 6-6.4 of the Standard Specifications.

The City shall be the sole authority to interpret all plans, specifications and contract documents, and no claim shall be accepted which is based on the Contractor's ignorance, misunderstanding or noncompliance with any provision or portion thereof.

The Contractor shall be responsible to provide all data and to obtain all approvals required by said Specifications. No claims or extras shall be approved by the City unless all work was done under the direction of and subject to the approval of the Inspector.

It is the intention of this Subsection that differences between the parties arising under and by virtue of the Contract be brought to the attention of the City Manager at the earliest possible time in order that such matters may be settled, if possible, or other appropriate action promptly taken. The Contractor hereby agrees that it shall have no right to additional compensation for any claim that may be based on any such act, failure to act, event, thing or occurrence for which no written notice of potential claim as herein required was filed.

5. Noncompliance with Plans and Specifications. Failure of the Contractor to comply with any requirement of the Plans and Specifications, and/or to immediately remedy any such noncompliance upon notice from the City Manager, may result in suspension of Contract Progress Payments. Any Progress Payments so suspended shall remain in suspension until the Contractor's operations and/or submittals are brought into compliance to the satisfaction of the City Manager. No additional compensation shall be allowed as a result of suspension of Progress Payments due to noncompliance with the plans or specifications. The Contractor shall not be permitted to stop work due to said suspension of Progress Payments.
6. Request for Payment. Contractor shall submit all requests for payment on AIA Document G702 – Application and Certificate for Payment and G703- Continuation Sheet. For each item provide a column for listing: Item Number; Description of Work; Scheduled Value, Previous Application; Authorized Change Orders; Total completed and Stored to Date of Application; Percentage of Completion; Balance to Finish; and Retainage.

Prior to submittal of said form, all items for which payment is requested shall be checked and approved in writing by the City Manager. No payments will be made unless all back-up data is submitted with the payment request and the Progress Payment Invoice is signed by both Contractor and Manager.

The City will retain 5 percent of the value of all work done and materials installed as part security for fulfillment of the contract by Contractor. The full 5 percent retention will be retained on all payments for 35 days after the filing of the Notice of Completion.

There shall be no separate payment for any relocations, barriers or forms, grading or temporary construction required to construct the improvements herein. Payment for these items shall be absorbed in the Bid Prices for the applicable work to which they are appurtenant, and no extra costs shall be allowed.

The payment of amounts due to the Contractor shall be contingent upon the Contractor furnishing the City with a release of all claims against the City arising by virtue of the Contract related to said amounts. It is the contractor's responsibility to provide the correct releases in order to obtain payment by the City. The Contractor shall provide the City with Unconditional Lien Release on Final Payment with a zero balance is required from all material suppliers and subcontractors with the request for final payment.

PART D
BID DOCUMENTS

BIDDER'S PROPOSAL

**BID FOR ELECTRICAL FOR TRANSIT BUS WASH EQUIPMENT
B2014-13**

In accordance with the Notice Inviting Bids pertaining to the receiving of sealed proposals by the City Clerk of the City of Torrance for the above titled improvement, the undersigned hereby proposes to furnish all work to be performed in accordance with the Plans, Specifications and Contract Documents, prepared by Breen Engineering for the lump sum bid as set forth in the following schedules.

Assignment of Contractor's values:

Item	Description	Total Amount
Division 01	General Requirements:	
Division 02	Site Work:	
Division 03	Concrete:	
Division 04	Masonry:	
Division 05	Metals:	
Division 06	Wood and Plastics:	
Division 07	Thermal and Moisture Protection:	
Division 08	Doors and Windows:	
Division 09	Finishes:	
Division 10	Specialties:	
Division	Equipment:	

11		
Division 12	Furnishings:	
Division 13	Special Construction:	

Item	Description	Total Amount
Division 14	Conveying Systems:	
Division 15	Mechanical:	
Division 16	Electrical:	
	B2014-13 -BID TOTAL- in figures*	

BID TOTAL: _____
(Words)*

***BID MAY BE REJECTED IF TOTAL IS NOT SHOWN IN FIGURES AND WORDS.**

The undersigned furthermore agrees to enter into and execute a contract, with necessary bonds, at the prices set forth herein and in case of default in executing such contract, with necessary bonds, the check or bond accompanying this bid and the money payable thereon shall be forfeited thereby to and remain the property of the City of Torrance.

The above prices include all work appurtenant to the various items as outlined in the specifications and all work or expense required for the satisfactory completion of said item.

The undersigned declares that it has carefully examined the Plans, Specifications, and Contract Documents, and has investigated the site of the work and is familiar with the conditions thereon.

 Contractor Name

Signer's Name and Title

Date: _____ License No. & Classification

Address:

ACKNOWLEDGMENT OF ADDENDA RECEIVED

B2014-13

The Bidder shall acknowledge the receipt of addenda by placing an "X" by each addendum received.

Addendum No. 1 _____

Addendum No. 2 _____

Addendum No. 3 _____

Addendum No. 4 _____

Addendum No. 5 _____

Addendum No. 6 _____

Addendum No. 7 _____

Addendum No. 8 _____

If an addendum or addenda have been issued by the City and not noted above as being received by the Bidder, the Bid Proposal may be rejected.

Bidder's Signature

Date

CONTRACTOR'S AFFIDAVIT (CONTINUED)

7. That the Contractor did not, directly or indirectly, submit the Contractor's bid price or any breakdown thereof, or the contents thereof, or divulge information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, or to any individual or group of Individuals, except to the City of Torrance, or to any person or persons who have a partnership or other financial interest with said Contractor in its business.

Dated this _____ day of _____, 20_____.

Subscribed and Sworn to
before me this _____
of _____, 20_____

(Contractor)

(Title)

Notary Public in and for said
County and State.
(Seal)

BID BOND

B2014-13

KNOW ALL MEN BY THESE PRESENTS: That we, _____

_____ as principal, and _____ as sureties, are held and firmly bound unto the City of Torrance, State of California, in the penal sum of _____ dollars (\$_____), for the payment whereof we hereby bind ourselves, our successors, heirs, executors or administrators jointly and severally, firmly by these presents.

The condition of this obligation is such that, whereas the above bounded principal is about to file with and submit to the City of Torrance a bid or proposal for the performance of certain work as required in the City of Torrance, Project No. B2014-13, said work being: Electrical for Bus Wash Equipment, in compliance with the Specifications therefore under an invitation of said City contained in a notice or advertisement for bids or proposals; now if the bid or proposal of said principal shall be accepted and if said work be thereupon awarded to the principal by said City and if the said principal shall enter into a contract with the said City in accordance with said bid or proposal, or if the bid or proposal of the said principal is rejected, then this bond shall be void and of no effect and otherwise in full force and effect.

WITNESS our hands this _____ day of _____, 20 _____.

Principal

Surety/Attorney-in-Fact

Signature

Name: _____
Local Address: _____
Phone No.: _____
Fax No.: _____

LIST OF SUBCONTRACTORS

The Bidder is required to fill in the following blanks in accordance with the provisions of the Subletting and Subcontracting Fair Practices Act (Chapter 2 of Division 5, Title 1 of the Government Code of the State of California) and should familiarize itself with Section 2-3 of the Standard Specifications.

Name under Which Subcontractor is Licensed: _____

License Number: _____
Address of Office, Mill or Shop: _____

Specific Description of Sub-Contract: _____

Name under Which Subcontractor is Licensed: _____

License Number: _____
Address of Office, Mill or Shop: _____

Specific Description of Sub-Contract: _____

Name under Which Subcontractor is Licensed: _____

License Number: _____
Address of Office, Mill or Shop: _____

Specific Description of Sub-Contract: _____

Name Under Which Subcontractor is Licensed: _____

License Number: _____
Address of Office, Mill or Shop: _____

Specific Description of Sub-Contract: _____

Subcontractors listed in accordance with the provisions of Section 2-3 must be properly licensed under the laws of the State of California for the type of work which they are to perform. Do not list alternate subcontractors for the same work.

REFERENCES

(Public Works projects similar in magnitude and degree of difficulty completed by Contractor within the past five (5) years.).

1.Name (Firm/Agency): _____

Address:_____

Contact Person:_____ Telephone No.:_____

Title of Project:_____

Project Location: _____

Date _____ of _____ Completion_____ Contract
Amount:\$_____

2.Name (Firm/Agency): _____

Address:_____

Contact Person:_____ Telephone No.:_____

Title of Project:_____

Project Location: _____

Date _____ of _____ Completion_____ Contract
Amount:\$_____

3.Name (Firm/Agency): _____

Address:_____

Contact Person:_____ Telephone No.:_____

Title of Project:_____

Project Location: _____

Date _____ of _____ Completion_____ Contract
Amount:\$_____

4.Name (Firm/Agency): _____

Address: _____

Contact Person:_____ Telephone No.:_____

Title of Project:_____

Project Location: _____

Date of Completion _____ Contract Amount: \$ _____

Bidder's Information

The bidder must provide a detailed list of the trades and the description of the work they will perform with their own company for this project.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

14. _____

Contractor's License No.: _____ Class: _____

Date first obtained: _____

Has License ever been suspended or revoked? _____

If yes, describe when and why _____

Any current claims against License or Bond? _____

If yes, describe claims: _____

Type of entity (check one)

_____ Incorporated _____ Partnership _____ Sole Proprietorship

If incorporated, in what state _____

Federal Tax ID Number # _____

Principals in Company (List all - attach additional sheets if necessary):

<u>NAME</u>	<u>TITLE</u>	<u>LICENSE NO.</u> (If Applicable)
_____	_____	_____
_____	_____	_____
_____	_____	_____

PART E.

**DOCUMENTS TO BE COMPLETED
AND DELIVERED TO CITY AS PART
OF CONTRACT WITH THE CITY**

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That we, _____ as Principal(s) and ___ a _____ corporation, incorporated, organized, and existing under the laws of the State of _____, and authorized to execute bonds and undertakings and to do a general surety business in the State of California, as Surety, are jointly and severally held and firmly bound unto the City of Torrance, a municipal corporation, located in the County of Los Angeles, State of California, in the full and just sum of: _____ Dollars (\$_____), lawful money of the United States of America, for the payment of which sum, well and truly to be made, we bind ourselves and our respective heirs, executors, administrators, representative, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that: WHEREAS, said Principal(s) have/has entered into, or are/is about to enter into, a certain written contract or agreement, dated as of the _____ day of _____, 20____, with the said City of Torrance for the ELECTRICAL FOR TRANSIT BUS WASH EQUIPMENT B2014-13, all as is more specifically set forth in said contract or agreement, a full, true and correct copy of which is hereunto attached, and hereby referred to and by this reference incorporated herein and made a part hereof;

NOW, THEREFORE, if the said Principal(s) shall faithfully and well and truly do, perform and complete, or cause to be done, performed and complete, each and all of the covenants, terms, conditions, requirements, obligations, acts and things, to be met, done or performed by said Principal(s), including any guarantee period as set forth in, or required by, said contract or agreement, all at and within the time or times, and in the manner as therein specified and contemplated, then this bond and obligation shall be null and void; otherwise it shall be and remain in full force, virtue and effect.

The said Surety, for value received, hereby stipulates and agrees that no amendment, change, extension of time, alteration or addition to said contract or agreement, or of any feature or item or items of performance required therein or there under, shall in any manner affect its obligations on or under this bond; and said Surety does hereby waive notice of any such amendment, change, extension of time, alteration, or addition to said contract or agreement, and of any feature or item or items of performance required therein or there under.

PERFORMANCE BOND (CONTINUED)

In the event any suit, action or proceedings is instituted to recover on this bond or obligation, said Surety will pay, and does hereby agree to pay, as attorney's fees for said City, such sum as the Court in any such suit, action or proceeding may adjudge reasonable.

EXECUTED, SEALED AND DATED this _____ day of _____,
20____

CORPORATE SEAL

PRINCIPAL(S):

BY _____

BY _____

CORPORATE SEAL

SURETY:

BY _____

Name: _____
Local Address: _____
Phone No.: _____
Fax No.: _____

LABOR AND MATERIAL BOND

KNOW ALL MEN BY THESE PRESENTS:

That we, _____
As Principal(s) and _____ a
corporation, incorporated, organized, and existing under the laws of the State of
_____, and authorized to execute bonds and undertakings and to do a general
surety business in the State of California, as Surety, are jointly and severally held and firmly
bound unto:

- (a) The State of California for the use and benefit of the State Treasurer, as ex-officio Treasurer and custodian of the Unemployment Fund of said State; and
- (b) The City of Torrance, California; and
- (c) Any and all persons who do or perform or who did or performed work or labor upon or in connection with the work or improvement referred to in the contract or agreement hereinafter mentioned; and
- (d) Any and all materialmen, persons, companies, firms, association, or corporations, supplying or furnishing any materials, provisions, provender, transportation, appliances or power, or other supplies used in, upon, for or about or in connection with the performance of the work or improvement contracted to be executed, done, made or performed under said contract or agreement; and
- (e) Any and all persons, companies, firms, associations, or corporations furnishing, renting, or hiring teams, equipment, implements or machinery for, in connection with, or contributing to, said work to be done or improvement to be made under said contract or agreement; and
- (f) Any and all persons, companies, firms, associations, or corporations who supply both work and materials;

and whose claim has not been paid by said Principal(s), in full and just sum of _____ Dollars (\$_____), lawful money of the United States of America, for the payment of which will and truly to be made, said Principal(s) and said Surety do hereby bind themselves and their respective heirs, executors, administrators, representatives, successors and assigns, jointly and severally, firmly by these presents.

LABOR AND MATERIAL BOND (CONTINUED)

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH, THAT: WHEREAS, said Principal(s) have/has entered into or are/is about to enter into a certain written contract or agreement, dated as of the _____ day of _____ 20 ____, with the City of Torrance for the ELECTRICAL FOR TRANSIT BUS WASH EQUIPMENT, B2014-13, all as is more specifically set forth in said contract or agreement, a full, true and correct copy of which is hereunto attached, and hereby referred to and by this reference incorporated herein and made a part hereof;

NOW, THEREFORE, if the said Principal(s) (or any of his/her, its, or their subcontractors) under said contract or agreement fails or fail to pay:

- (1) For any materials, provisions, provender, transportation, appliances, or power, or other supplies; or
- (2) For the hire of any teams, equipment, implements, or machinery; or
- (3) For any work or labor; supplies, furnished, provided, used, done or performed in, upon, for or about or in connection with the said work or improvement; or
- (4) For amounts due under the Unemployment Insurance Act of the State of California with respect to such work or improvement;

the Surety on this bond will pay the same in an amount not exceeding the sum hereinabove specified in this bond; and, also, in case suit is brought upon this bond, said Surety will (and does hereby agree to) pay a reasonable attorney's fee, to be fixed and taxed as costs, and included in the judgment therein rendered.

This bond shall (and it is hereby made to) insure to the benefit of any and all persons entitled to file claims under Section 1192.1 of the Code of Civil Procedure of the State of California, so as to give a right of action to them or their assigns in any suit brought upon this bond, all as contemplated under the provisions of Section 4205 of the Government Code, and of Chapter 1 of Title 4 of Part 3 of the Code of Civil Procedure, of the State of California.

This bond is executed and filed in connection with said contract or agreement hereunto attached to comply with each and all of the provisions of the laws of the State of California above mentioned or referred to, and of all amendments thereto, and the obligors so intend and do hereby bind themselves accordingly.

LABOR AND MATERIAL BOND (CONTINUED)

The said Surety, for value received, hereby stipulates and agrees that no amendment, change, extension of time, alteration, or addition to said contract or agreement, or of any feature or item or items of performance required therein or thereunder, shall in any manner affect its obligations on or under this bond; and said Surety does hereby waive notice of any such amendment, change, extension of time, alteration, or addition to said contract or agreement, and of any feature or item or items of performance required therein or thereunder.

EXECUTED, SEALED AND DATED this _____ day of _____, 20 _____

CORPORATE SEAL

PRINCIPAL:

BY _____

CORPORATE SEAL

SURETY:

BY _____

Name: _____
Local Address: _____
Phone No.: _____
Fax No.: _____

PUBLIC WORKS AGREEMENT

This PUBLIC WORKS AGREEMENT ("Agreement") is made and entered into as of Effective Date, by and between the CITY OF TORRANCE, a municipal corporation ("CITY"), and Company Name, type of Entity.

RECITALS:

- A. The CITY wishes to retain the services of an experienced and qualified CONTRACTOR to furnish all labor, materials, tools, equipment and incidentals in accordance with the plans and specifications prepared for the City of Torrance by Breen Engineering;
- B. In order to obtain the desired services, The CITY has circulated a Notice Inviting Bids for Electrical for Transit Bus Wash Equipment, Notice Inviting Bids No. **B2014-13** (the "NIB"); and
- C. CONTRACTOR has submitted a Bid (the "Bid") in response to the NIB. CONTRACTOR represents that it is qualified to perform those services requested in the Plans and Specifications. Based upon its review of all Bids submitted in response to the NIB, The CITY is willing to award the contract to CONTRACTOR.

AGREEMENT:

1. SERVICES TO BE PERFORMED BY CONTRACTOR

CONTRACTOR will provide the services and install those materials listed in the Plans and Specifications, which are on file in the General Services Department. The NIB and the Plans and Specifications are made a part of this Agreement. A copy of the Bid is attached as Exhibit A.

2. TERM

Unless earlier terminated in accordance with Paragraph 4 below, this Agreement will continue in full force and effect for one year from Effective Date.

3. COMPENSATION

A. CONTRACTOR's Fee.

For services rendered pursuant to this Agreement, CONTRACTOR will be paid in accordance with CONTRACTOR's Bid; provided, however, that in no event will the total amount of money paid the CONTRACTOR, for services initially contemplated by this Agreement, exceed the sum of \$ unless otherwise first approved in writing by the CITY.

B. Schedule of Payment.

Provided that the CONTRACTOR is not in default under the terms of this Agreement, upon presentation of an invoice, CONTRACTOR will be paid monthly, within 30 days after the date of the monthly invoice.

4. TERMINATION OF AGREEMENT

A. Termination by CITY for Convenience.

1. CITY may, at any time, terminate the Agreement for CITY's convenience and without cause.
2. Upon receipt of written notice from CITY of such termination for CITY's convenience, CONTRACTOR will:
 - a. cease operations as directed by CITY in the notice;
 - b. take actions necessary, or that CITY may direct, for the protection and preservation of the work; and
 - c. except for work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.
3. In case of such termination for CITY's convenience, CONTRACTOR will be entitled to receive payment for work executed; and costs incurred by reason of such termination, along with reasonable overhead and profit on the work not executed.

B. Termination for Cause.

1. If either party fails to perform any term, covenant or condition in this Agreement and that failure continues for 15 calendar days after the nondefaulting party gives the defaulting party written notice of the failure to perform, this Agreement may be terminated for cause; provided, however, that if during the notice period the defaulting party has promptly commenced and continues diligent efforts to remedy the default, the defaulting party will have such additional time as is reasonably necessary to remedy the default.
2. In the event this Agreement is terminated for cause by the default of the CONTRACTOR, the CITY may, at the expense of the CONTRACTOR and its surety, complete this Agreement or cause it to be completed. Any check or bond delivered to the CITY in connection with this Agreement, and the money payable thereon, will be forfeited to and remain the property of the CITY. All moneys due the CONTRACTOR under the terms of this Agreement will be retained by the CITY, but the retention will not release the CONTRACTOR and its surety from liability for the default. Under these circumstances, however, the CONTRACTOR and its surety will be credited with the amount of money retained, toward any amount by which the cost of completion exceeds the Agreement Sum and any amount authorized for extra services.
3. Termination for cause will not affect or terminate any of the rights of the CITY as against the CONTRACTOR or its surety then existing, or which

may thereafter accrue because of the default; this provision is in addition to all other rights and remedies available to the CITY under law.

C. Termination for Breach of Law.

In the event the CONTRACTOR or any of its officers, directors, shareholders, employees, agents, subsidiaries or affiliates is convicted (i) of a criminal offense as an incident to obtaining or attempting to obtain a public or private contract or subcontract, or in the performance of a contract or subcontract; (ii) under state or federal statutes of embezzlement, theft, forgery, bribery, falsification or destruction of records, receiving stolen property, or any other offense indicating a lack of business integrity or business honesty which currently, seriously, and directly affects responsibility as a public consultant or contractor; (iii) under state or federal antitrust statutes arising out of the submission of bids or proposals; or (iv) of violation of Paragraph 19 of this Agreement; or for any other cause the CITY determines to be so serious and compelling as to affect CONTRACTOR's responsibility as a public consultant or contractor, including but not limited to, debarment by another governmental agency, then the CITY reserves the unilateral right to terminate this Agreement or to impose such other sanctions (which may include financial sanctions, temporary suspensions or any other condition deemed appropriate short of termination) as it deems proper. The CITY will not take action until CONTRACTOR has been given notice and an opportunity to present evidence in mitigation.

5. **FORCE MAJEURE**

If any party fails to perform its obligations because of strikes, lockouts, labor disputes, embargoes, acts of God, inability to obtain labor or materials or reasonable substitutes for labor or materials, governmental restrictions, governmental regulations, governmental controls, judicial orders, enemy or hostile governmental action, civil commotion, fire or other casualty, or other causes beyond the reasonable control of the party obligated to perform, then that party's performance shall be excused for a period equal to the period of such cause for failure to perform.

6. **RETENTION OF FUNDS**

CONTRACTOR authorizes the CITY to deduct from any amount payable to CONTRACTOR (whether or not arising out of this Agreement) any amounts the payment of which may be in dispute or that are necessary to compensate the CITY for any losses, costs, liabilities, or damages suffered by the CITY, and all amounts for which the CITY may be liable to third parties, by reason of CONTRACTOR's negligent acts or omissions or willful misconduct in performing or failing to perform CONTRACTOR's obligations under this Agreement. In the event that any claim is made by a third party, the amount or validity of which is disputed by CONTRACTOR, or any indebtedness exists that appears to be the basis for a claim of lien, the CITY may withhold from any payment due, without liability for interest because of the withholding, an amount sufficient to cover the claim. The failure of the CITY to exercise the right to deduct or to withhold will not, however, affect the obligations of CONTRACTOR to insure, indemnify, and protect the CITY as elsewhere provided in this Agreement.

7. THE CITY'S REPRESENTATIVE

Jim Fuentes, HVAC/Electrical Supervisor is designated as the "City Representative," authorized to act in its behalf with respect to the work and services specified in this Agreement and to make all decisions in connection with this Agreement. Whenever approval, directions, or other actions are required by the CITY under this Agreement, those actions will be taken by the City Representative, unless otherwise stated. The City Manager has the right to designate another City Representative at any time, by providing notice to CONTRACTOR.

8. CONTRACTOR REPRESENTATIVE(S)

The following principal(s) of CONTRACTOR are designated as being the principal(s) and representative(s) of CONTRACTOR authorized to act in its behalf with respect to the work specified in this Agreement and make all decisions in connection with this Agreement:

Company Representative

9. INDEPENDENT CONTRACTOR

The successful proposer is, and will at all times remain as to the City, a wholly independent contractor. Neither the City nor any of its agents will have control over the conduct of the Contractor or any of the Contractor's employees, except as otherwise set forth in the awarded Agreement. The Contractor's agents and employees are not and will not be considered employees of the City for any purpose. The Contractor may not, at any time or in any manner, represent that it or any of its agents or employees are in any manner agents or employees of the City. The City has no duty, obligation, or responsibility to the Contractor's agents or employees under the Affordable Care Act. The Contractor is solely responsible for any tax penalties associated with the failure to offer affordable coverage to its agents and employees under the Affordable Care Act and any other liabilities, claims and obligations regarding compliance with the Affordable Care Act with respect to the Contractor's agents and employees. The City is not responsible and will not be held liable for the Contractor's failure to comply with the Contractor's duties, obligations, and responsibilities under the Affordable Care Act. The Contractor agrees to defend, indemnify and hold the City harmless for any and all taxes and penalties that may be assessed against the City as a result of the Contractor's obligations under the Affordable Care Act relating to the Contractor's agents and employees.

10. BUSINESS LICENSE

The CONTRACTOR must obtain a City business license prior to the start of work under this Agreement, unless CONTRACTOR is qualified for an exemption.

11. OTHER LICENSES AND PERMITS

CONTRACTOR warrants that it has all professional, contracting and other permits and licenses required to undertake the work contemplated by this Agreement.

12. FAMILIARITY WITH WORK

By executing this Agreement, CONTRACTOR warrants that CONTRACTOR (a) has thoroughly investigated and considered the scope of services to be performed, (b) has carefully considered how the services should be performed, and (c) fully understands the facilities, difficulties and restrictions attending performance of the services under this Agreement. If the services involve work upon any site, CONTRACTOR warrants that CONTRACTOR has or will investigate the site and is or will be fully acquainted with the conditions there existing, prior to commencement of services set forth in this Agreement. Should CONTRACTOR discover any latent or unknown conditions that will materially affect the performance of the services set forth in this Agreement, CONTRACTOR must immediately inform the CITY of that fact and may not proceed except at CONTRACTOR's risk until written instructions are received from the CITY.

13. CARE OF WORK

CONTRACTOR must adopt reasonable methods during the life of the Agreement to furnish continuous protection to the work, and the equipment, materials, papers, documents, plans, studies and other components to prevent losses or damages, and will be responsible for all damages, to persons or property, until acceptance of the work by the CITY, except those losses or damages as may be caused by the CITY's own negligence.

14. CONTRACTOR'S ACCOUNTING RECORDS; OTHER PROJECT RECORDS

Records of the CONTRACTOR's time pertaining to the project, and records of accounts between the CITY and the CONTRACTOR, will be kept on a generally recognized accounting basis. CONTRACTOR will also maintain all other records, including without limitation specifications, drawings, progress reports and the like, relating to the project. All records will be available to the CITY during normal working hours. CONTRACTOR will maintain these records for three years after final payment.

15. INDEMNIFICATION

CONTRACTOR will indemnify, defend, and hold harmless CITY, the City Council, each member thereof, present and future, its officers, agents and employees from and against any and all liability, expenses, including defense costs and legal fees, and claims for damages whatsoever, including, but not limited to, those arising from breach of contract, bodily injury, death, personal injury, property damage, loss of use, or property loss however the same may be caused and regardless of the responsibility for negligence. The obligation to indemnify, defend and hold harmless includes, but is not limited to, any liability or expense, including defense costs and legal fees, arising from the negligent acts or omissions, or willful misconduct of CONTRACTOR, its officers, employees, agents, subcontractors or vendors. It is further agreed, CONTRACTOR's obligations to indemnify, defend and hold harmless will apply even in the event of concurrent negligence on the part of CITY, the City Council, each member thereof, present and future, or its officers, agents and employees, except for liability resulting solely from the negligence or willful misconduct of CITY, its officers, employees or agents. Payment by CITY is not a condition precedent to enforcement of this indemnity. In the event of any dispute between CONTRACTOR and CITY, as to whether liability arises from the sole negligence of the CITY or its officers, employees, agents, subcontractors or vendors, CONTRACTOR will be obligated to pay for CITY's defense

until such time as a final judgment has been entered adjudicating the CITY as solely negligent. CONTRACTOR will not be entitled in the event of such a determination to any reimbursement of defense costs including but not limited to attorney's fees, expert fees and costs of litigation.

16. NON-LIABILITY OF THE CITY'S OFFICERS AND EMPLOYEES

No officer or employee of the CITY will be personally liable to CONTRACTOR, in the event of any default or breach by the CITY or for any amount that may become due to CONTRACTOR.

17. INSURANCE

- A. CONTRACTOR must maintain at its sole expense the following insurance, which will be full coverage not subject to self insurance provisions:
 - (1) Automobile Liability, including owned, non-owned and hired vehicles, with at least the following limits of liability:
 - (a) Primary Bodily Injury with limits of at least \$500,000 per person, \$1,000,000 per occurrence; and
 - (b) Primary Property Damage of at least \$250,000 per occurrence; or
 - (c) Combined single limits of \$1,000,000 per occurrence.
 - (2) General Liability including coverage for premises, products and completed operations, independent contractors, personal injury and contractual obligations with combined single limits of coverage of at least \$2,000,000 per occurrence.
 - (3) Workers' Compensation with limits as required by the State of California and Employers Liability with limits of at least \$1,000,000.
- B. The insurance provided by CONTRACTOR will be primary and non-contributory.
- C. The CITY ("City of Torrance"), the Redevelopment Agency of the City of Torrance, the City Council and each member thereof, members of boards and commissions, every officer, agent, official, employee and volunteer must be named as additional insured under the automobile and general liability policies.
- D. CONTRACTOR must provide certificates of insurance and/or endorsements to the City Clerk of the City of Torrance before the commencement of work.
- E. Each insurance policy required by this Paragraph must contain a provision that no termination, cancellation or change of coverage can be made without thirty days notice to the CITY.

- F. CONTRACTOR must include all subcontractors as insureds under its policies or must furnish separate certificates and endorsements for each subcontractor. All coverage for subcontractors will be subject to all of the requirements of this Paragraph 17.

18. SUFFICIENCY OF INSURERS

Insurance required by this Agreement will be satisfactory only if issued by companies admitted to do business in California, rated "B+" or better in the most recent edition of Best's Key Rating Guide, and only if they are of a financial category Class VII or better, unless these requirements are waived by the Risk Manager of the CITY ("Risk Manager") due to unique circumstances. In the event the Risk Manager determines that the work or services to be performed under this Agreement creates an increased or decreased risk of loss to the CITY, the CONTRACTOR agrees that the minimum limits of any insurance policies and/or the performance bond required by this Agreement may be changed accordingly upon receipt of written notice from the Risk Manager; provided that CONTRACTOR will have the right to appeal a determination of increased coverage by the Risk Manager to the City Council of the CITY within 10 days of receipt of notice from the Risk Manager.

19. CONFLICT OF INTEREST

- A. No officer or employee of the CITY may have any financial interest, direct or indirect, in this Agreement, nor may any officer or employee participate in any decision relating to the Agreement that effects the officer or employee's financial interest or the financial interest of any corporation, partnership or association in which the officer or employee is, directly or indirectly interested, in violation of any law, rule or regulation.
- B. No person may offer, give, or agree to give any officer or employee or former officer or employee, nor may any officer or employee solicit, demand, accept, or agree to accept from another person, a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, preparation or any part of a program requirement or a purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any way pertaining to any program requirement, contract or subcontract, or to any solicitation or proposal.

20. NOTICE

- A. All notices, requests, demands, or other communications under this Agreement will be in writing. Notice will be sufficiently given for all purposes as follows:
 - (1) Personal delivery. When personally delivered to the recipient: notice is effective on delivery.

force or effect with respect to the terms of this Agreement. The Agreement may not be modified or altered except in writing signed by both parties.

23. INTERPRETATION

The terms of this Agreement should be construed in accordance with the meaning of the language used and should not be construed for or against either party by reason of the authorship of this Agreement or any other rule of construction that might otherwise apply.

24. SEVERABILITY

If any part of this Agreement is found to be in conflict with applicable laws, that part will be inoperative, null and void insofar as it is in conflict with any applicable laws, but the remainder of the Agreement will remain in full force and effect.

25. TIME OF ESSENCE

Time is of the essence in the performance of this Agreement.

26. GOVERNING LAW; JURISDICTION

This Agreement will be administered and interpreted under the laws of the State of California. Jurisdiction of any litigation arising from the Agreement will be in Los Angeles County, California.

27. COMPLIANCE WITH STATUTES AND REGULATIONS

CONTRACTOR will be knowledgeable of and will comply with all applicable federal, state, county and city statutes, rules, regulations, ordinances and orders.

28. WAIVER OF BREACH

No delay or omission in the exercise of any right or remedy by a nondefaulting party on any default will impair the right or remedy or be construed as a waiver. A party's consent or approval of any act by the other party requiring the party's consent or approval will not be deemed to waive or render unnecessary the other party's consent to or approval of any subsequent act. Any waiver by either party of any default must be in writing and will not be a waiver of any other default concerning the same or any other provision of this Agreement.

29. ATTORNEY'S FEES

Except as provided for in Paragraph 15, in any dispute, litigation, arbitration, or other proceeding by which one party either seeks to enforce its rights under this Agreement (whether in contract, tort or both) or seeks a declaration of any rights or obligations under this Agreement, the prevailing party will be awarded reasonable attorney's fees, together with any costs and expenses, to resolve the dispute and to enforce any judgment.

30. EXHIBITS

All exhibits identified in this Agreement are incorporated into the Agreement by this reference.

31. CONTRACTOR'S AUTHORITY TO EXECUTE

The persons executing this Agreement on behalf of the CONTRACTOR warrant that (i) the CONTRACTOR is duly organized and existing; (ii) they are duly authorized to execute this Agreement on behalf of the CONTRACTOR; (iii) by so executing this Agreement, the CONTRACTOR is formally bound to the provisions of this Agreement; and (iv) the entering into this Agreement does not violate any provision of any other Agreement to which the CONTRACTOR is bound.

CITY OF TORRANCE,
a Municipal Corporation

Company Name
Type of Entity

Frank Scotto, Mayor

By: _____
Name
Title

ATTEST:

Sue Herbers, City Clerk

APPROVED AS TO FORM:

JOHN L. FELLOWS III
City Attorney

By: _____

Attachments: Exhibit A: Bid

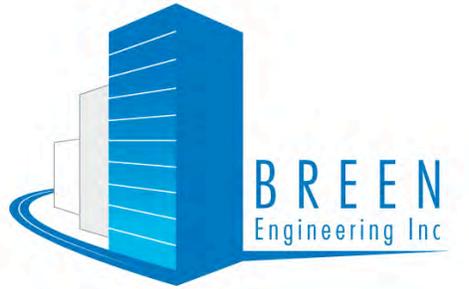
EXHIBIT A

Bid

[To be attached]

PART F

PROJECT SPECIFICATIONS



City of Torrance
General Services Department
Vehicle Wash Equipment Upgrade
20500 Madrona Avenue, Torrance, CA 90503

Engineering Specifications

Bid Documents
November 2013

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SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceways and cables.
 - 2. Sleeve seals.
 - 3. Grout.
 - 4. Common electrical installation requirements.

1.2 SUBMITTALS

- A. Product Data: For sleeve seals.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 3. Pressure Plates: Stainless steel. Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.

- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 260500

SECTION 26 05 19 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
 - 3. Sleeves and sleeve seals for cables.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. American Insulated Wire Corp.; a Leviton Company.
 - 3. General Cable Corporation.
 - 4. Senator Wire & Cable Company.
 - 5. Southwire Company.
- B. Aluminum and Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN XHHW USE and SO.
- D. Multi-conductor Cable: Comply with NEMA WC 70 for armored cable Type AC, metal clad cable Type MC and non-metallic sheathed cable Type NM.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.

2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.4 SLEEVE SEALS

- A. Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
1. Advance Products & Systems, Inc.
 2. Calpico, Inc.
 3. Metraflex Co.
 4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 2. Pressure Plates: Stainless steel. Include two for each sealing element.
 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single core conductors in raceway or Type SE or USE multi-conductor cable.

- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway or metal-clad Type MC.
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and underground: Type THHN-THWN, single conductors in raceway.
- D. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway, or metal-clad Type MC.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway, or metal-clad Type MC.
- F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and underground: Type THHN-THWN, single conductors in raceway.
- G. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- H. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."
- G. 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 and UL 486B.
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Cut sleeves to length for mounting flush with both wall surfaces.
- E. Extend sleeves installed in floors 2 inches above finished floor level.
- F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."
- I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."
- J. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- K. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- L. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.5 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground exterior-wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.6 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements.
 - a. Diesel generator

- b. Emergency panelboard
 - c. Main distribution panel circuit breakers
 - d. Fire Alarm system
- 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
 - a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.
- C. Test Reports: Prepare a written report to record the following:
- 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 26 05 26 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Grounding systems and equipment.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
 - 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 - 9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.
 - 1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
 - 3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

- E. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Test Wells: Ground rod driven through drilled hole in bottom of hand hole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.
 - 1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 LABELING

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.
- B. Install labels at the telecommunications bonding conductor and grounding equalizer[and at the grounding electrode conductor where exposed].

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Make tests at ground rods before any conductors are connected.
- B. Report measured ground resistances that exceed the following values:
 1. Power and Lighting Equipment or System with Capacity of 500 kVA and less: 10 ohms.
 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
- C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 26 05 29 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 SUBMITTALS

- A. Product Data: For steel slotted support systems.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Equipment supports.
- C. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.

- b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 5. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where it's Table 1 lists maximum spacing's less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. 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 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC RMC EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.
 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 7. To Light Steel: Sheet metal screws.
 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Miscellaneous Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Division 09 Section "High-Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 26 05 33 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. See Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks and manholes, and underground handholes, boxes, and utility construction.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. IMC: ANSI C80.6.
- C. EMT: ANSI C80.3.
- D. FMC: Zinc-coated steel.
- E. LFMC: Flexible steel conduit with PVC jacket.
- F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 - 2. Fittings for EMT: Steel type.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. ENT: NEMA TC 13.
- B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- C. LFNC: UL 1660.
- D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- E. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Square D; Schneider Electric.
- C. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 3R, unless otherwise indicated.
- D. Fittings and Accessories: Include 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.
- E. Wireway Covers: Hinged type.
- F. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hoffman.
 - 2. Lamson & Sessions; Carlon Electrical Products.
- B. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.
- C. Fittings and Accessories: Include 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.

2.5 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Thomas & Betts Corporation.
 - b. Walker Systems, Inc.; Wiremold Company (The).
 - c. Wiremold Company (The); Electrical Sales Division.
- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard custom colors.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Butler Manufacturing Company; Walker Division.
 - b. Enduro Systems, Inc.; Composite Products Division.
 - c. Hubbell Incorporated; Wiring Device-Kellems Division.
 - d. Lamson & Sessions; Carlon Electrical Products.
 - e. Panduit Corp.
 - f. Walker Systems, Inc.; Wiremold Company (The).
 - g. Wiremold Company (The); Electrical Sales Division.

2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- D. Metal Floor Boxes: Cast or sheet metal, fully adjustable, rectangular.
- E. Nonmetallic Floor Boxes: Nonadjustable, round.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.
- H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic finished inside with radio-frequency-resistant paint.
- I. Cabinets:
 - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit IMC RNC.
 - 2. Concealed Conduit, Aboveground: Rigid steel conduit IMC EMT RNC.
 - 3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Comply with the following indoor applications, unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT or RNC.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT identified for such use.
 - 3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT or RNC, Type EPC-40-PVC.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 - 6. Damp or Wet Locations: Rigid steel conduit.
 - 7. Raceways for Optical Fiber or Communications Cable: EMT.

8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:
 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 3. Change from ENT to RNC, rigid steel conduit, before rising above the floor.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- K. Raceways for Optical Fiber and Communications Cable: Install as follows:
 1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
 2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
 3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where otherwise required by NFPA 70.
- M. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
 1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.

- b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
- c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
- d. Attics: 135 deg F temperature change.
- 2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
- 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
- N. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semi recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- O. 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.
- P. Set metal floor boxes level and flush with finished floor surface.
- Q. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches in nominal diameter.
 - 2. Install backfill as specified in Division 31 Section "Earth Moving."
 - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
 - 4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
 - 5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
 - b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
 - 6. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits, placing those 24 inches o.c. Align planks along the width and along the centerline of conduit.

3.4 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 260533

SECTION 26 05 48 – VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Isolation pads.
 - 2. Spring isolators.
 - 3. Restrained spring isolators.
 - 4. Channel support systems.
 - 5. Restraint cables.
 - 6. Hanger rod stiffeners.
 - 7. Anchorage bushings and washers.

1.2 PERFORMANCE REQUIREMENTS

- A. Wind-Restraint Loading:
 - 1. Basic Wind Speed: 85mph, exposure B
 - 2. Building Classification Category: I = 1.0.
 - 3. Minimum 25 lb/sq. ft. multiplied by the maximum area of the component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal at the roof level.
- B. Seismic-Restraint Loading:
 - 1. Seismic coefficients per LABC 2010: $S_{ms}=2.008$, $S_{m1}=1.023$, $S_{ds}=1.339$, $S_{d1}=0.682$, Site Class D, Seismic Design Category = D.
 - 2. Site Class as Defined in the IBC: D.
 - 3. Assigned Seismic Use Group or Building Category as Defined in the LABC: II.
 - a. Component Importance Factor: 1.5. ($I_p=1.5$ for components that are required for life-safety purposed after an earthquake such as fire sprinklers, or if it contains hazardous material per ASCE 7-05 13.1.3, otherwise it can be 1.0
 - b. Component Response Modification Factor: ASCE 7-05 Table 13.6-1
 - c. Component Amplification Factor: 2.5 at the concrete floors and 3 at the wood floors
 - 4. Design Spectral Response Acceleration at Short Periods (0.2 Second):
 - 5. Design Spectral Response Acceleration at 1.0-Second Period:

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
 - 3. Restrained-Isolation Devices: Include ratings for horizontal, vertical, and combined loads.

- B. Delegated-Design Submittal: For [vibration isolation and]seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.
 - a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other Division 26 Sections for equipment mounted outdoors.
 - 2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
 - 3. Field-fabricated supports.
 - 4. Seismic-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacing's. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).
- C. Welding certificates.
- D. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
- D. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
 - 1. Ace Mountings Co., Inc.

2. Amber/Booth Company, Inc.
 3. California Dynamics Corporation.
 4. Isolation Technology, Inc.
 5. Kinetics Noise Control.
 6. Mason Industries.
 7. Vibration Eliminator Co., Inc.
 8. Vibration Isolation.
 9. Vibration Mountings & Controls, Inc.
- D. Pads: Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
1. Resilient Material: Oil- and water-resistant neoprene.
- E. Spring Isolators: Freestanding, laterally stable, open-spring isolators.
1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
 6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.
- F. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.
1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch-thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
 2. Restraint: Seismic or limit-stop as required for equipment and authorities having jurisdiction.
 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.2 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amber/Booth Company, Inc.
 2. California Dynamics Corporation.
 3. Cooper B-Line, Inc.; a division of Cooper Industries.
 4. Hilti Inc.
 5. Loos & Co.; Seismic Earthquake Division.
 6. Mason Industries.
 7. TOLCO Incorporated; a brand of NIBCO INC.

8. Unistrut; Tyco International, Ltd.
- B. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an evaluation service member of ICC-ES
1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
- D. Restraint Cables: ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.
- F. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.
- G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.
- H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- I. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
- J. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment and Hanger Restraints:
1. Install restrained isolators on electrical equipment.
 2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

- B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- D. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 2. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 - 3. Test to 90 percent of rated proof load of device.
 - 4. Measure isolator restraint clearance.
 - 5. Measure isolator deflection.
 - 6. Verify snubber minimum clearances.
 - 7. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.
- B. Remove and replace malfunctioning units and retest as specified above.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust isolators after isolated equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of spring isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548

SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

- E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tapes not less than 3 mils thick by 1 to 2 inches wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- D. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.5 FLOOR MARKING TAPE

- A. 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
 3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE
- C. Tag: Type I:
 1. Pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
 2. Thickness: 4 mils
 3. Weight: 18.5 lb/1000 sq. ft.
 4. 3-Inch Tensile According to ASTM D 882: 30 lbf, and 2500 psi .
- D. Tag: Type ID:
 1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, [continuous-printed on one side with the inscription of the utility,]compounded for direct-burial service.
 2. Overall Thickness: 5 mils
 3. Foil Core Thickness: 0.35 mil
 4. Weight: 28 lb/1000 sq. ft.
 5. 3-Inch Tensile According to ASTM D 882: 70 lbf and 4600 psi

2.7 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Baked-Enamel Warning Signs:
 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 2. 1/4-inch grommets in corners for mounting.
 3. Nominal size, 7 by 10 inches
- D. Metal-Backed, Butyrate Warning Signs:
 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.

2. 1/4-inch grommets in corners for mounting.
 3. Nominal size, 10 by 14 inches
- E. Warning label and sign shall include, but are not limited to, the following legends:
1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.8 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 1. Engraved legend with black letters on white face.
 2. Punched or drilled for mechanical fasteners.
 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.9 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.
- B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch
- C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by

side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
- G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Install labels at 10-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
 - 3. UPS.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

- G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
 - 1. Limit use of underground-line warning tape to direct-buried cables.
 - 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
 - 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
 - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.
- L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic, Stenciled legend 4 inches high.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
- M. Label each individual electrical device (outlets, switches, etc.) describing the panel and breaker number feeding it; clear white label with 3/16" high black font.

END OF SECTION 260553

SECTION 26 07 00 – ELECTRICAL EQUIPMENT NOISE CONTROL, VIBRATION ISOLATION AND SEISMIC RESTRAINT

PART 1 - GENERAL

1.1 SCOPE.

- A. Work included in this Section is used for studies.
 - 1. Work included in this Section.
 - a. Vibration isolation of transformers.
 - b. Vibration isolation of distribution panels connected to transformers.
 - c. Flexible conduits at transformer connections.
 - d. Electrical box-pads at stud partitions where sound insulation is provided.
 - e. Seismic restraint for vibration isolated equipment.
 - f. Flexible conduits at connections to motors and other vibrating equipment.

1.2 GENERAL REQUIREMENTS

- A. Coordination.
 - 1. The contractor shall coordinate his work with other trades to avoid rigid contact between isolated transformers, raceways and the building. He shall inform other trades following his work to avoid any contact that would reduce the vibration isolation.
- B. Conflicts and Discrepancies.
 - 1. The contractor shall bring to the architect's attention prior to installation any conflicts with other trades which will result in unavoidable contact to the equipment, raceways, etc., described herein, due to inadequate space, etc. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.
 - 2. The contractor shall bring to the architect's attention any discrepancies between the specifications and field conditions, changes required due to specific equipment selection, etc., prior to installation. Corrective work necessitated by discrepancies after installation shall be at the contractor's expense.
- C. Inspection and Instruction.
 - 1. The contractor shall obtain inspection and approval from the architect of any installation to be covered or enclosed prior to such closure.
 - 2. The contractor shall obtain written and/or oral instructions from the vibration isolation manufacturer as to the proper installation and adjustment of vibration isolation devices and seismic restraints.

1.3 SUBMITTAL

- A. Reference shall be made to general conditions for requirements pertaining to submittals, including preparation and transmittals. The submittal shall contain the following information:
 - 1. Catalog cuts and data sheets on specific vibration isolators, electrical box pads and other equipment to be utilized, showing compliance with the specification.
 - 2. An itemized list showing the items of equipment to be isolated, the isolator type and model number selected, isolator loading and deflection.

3. The contractor shall obtain written and/or oral instructions from the vibration isolation manufacturer as to the proper installation and adjustment of vibration isolation devices and seismic restraints.

1.4 ISOLATOR CONFIGURATION FOR FLOOR MOUNTED OR SUSPENDED EQUIPMENT.

- A. A maximum of four vibration isolators shall be provided, located at the corners of the equipment unless approval is obtained for additional isolators.
- B. Mounting frames and/or brackets shall be provided to carry the load of the equipment without causing mechanical distortion or stress to the equipment.
- C. Installation of flexible electrical connections to vibration isolated equipment shall in no way impair or restrain the function of the aforementioned vibration isolation.

1.5 SEISMIC RESTRAINT REQUIREMENTS

- A. Seismic restraint shall be furnished and installed in accordance with all relevant State and local Code requirements.

1.6 RESPONSIBILITY OF MANUFACTURER.

- A. Vibration isolation manufacturer shall have the following responsibilities:
 1. To determine vibration isolation sizes and locations.
 2. To provide equipment isolation system as scheduled or specified.
 3. To guarantee specified isolation system deflection.
 4. To provide installation instructions and drawings.
 5. To provide calculations signed by a structural engineer licensed in the State in which the work is to take place certifying that the seismic restraints will act in accordance with the relevant State and local codes and will maintain equipment in captive position.
 6. To provide approved resilient restraining devices as required to limit transformer motion in excess of 3/8 inch.
 7. To provide signature of a licensed structural engineer for all calculations on the seismic snubber.

1.7 VIBRATION ISOLATION AND NOISE CONTROL REQUIREMENTS.

- A. Floor Mounted Transformers.
 1. Type E, 0.15 inch static deflection.
 2. Locate at 4 corners of transformer.
 3. Bolt to floor.
 4. Wall mounted not permitted.
- B. Distribution Panels Connected to Transformers.
 1. Floor mounted connected to adjacent transformers within buildings by flexible conduit.
 2. Type E, 0.1 inch static deflection.
 3. Locate at 4 corners.
 4. Wall mounted not permitted.
- C. Flexible Electrical Connections.
 1. At all transformers within building.

2. At connections to motors or other vibrating equipment.

1.8 ELECTRICAL BOX PADS.

- A. Provide at all junction boxes located within sound insulated drywall partitions.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS.

A. General Properties

1. All vibration isolators shall have either known undeflected heights or other markings so that, after adjustment, when carrying their load, the deflection under load can be verified, thus determining that the load is within the proper range of the device and that the correct degree of vibration isolation is being provided according to the design.
2. All isolators shall operate in the linear portion of their load versus deflection curve. Load versus deflection curves shall be furnished by the manufacturer and must be linear over a deflection range 50% above the design deflection.
3. The ratio of lateral to vertical stiffness shall not be less than 1.0 or greater than 2.0.
4. The vertical natural frequency for each support point, based upon the load per isolator and isolator stiffness, shall not differ by more than + or - 10%.
5. All vibration isolation equipment exposed to moisture or an outdoor environment shall be coated as follows:
 - a. All steel parts to be hot-dipped galvanized.
 - b. All bolts to be cadmium plated.
 - c. All springs to be cadmium plated and neoprene coated.

B. Isolator Types and Descriptions.

1. Type E is a neoprene isolator capable of resisting a seismic load of 1.0 G in all directions. The mount shall consist of a captive steel insert embedded into a neoprene element that is enclosed by a steel housing which also includes floor mounting holes. The isolator shall have a rated deflection of 0.15 inches in compression, 0.12 inches in tension and 0.09 inches in shear.

2.2 FLEXIBLE CONNECTIONS.

- A. Conduit over 1 inch OD: Make electrical connections to vibrating equipment via flexible expansion/deflection conduit coupling sized as required. Coupling shall have a flexible and watertight outer jacket, an internal grounding strap, plastic inner sleeve to maintain smooth wireway and end hubs with threads to fit standard threaded metal conduit. Acceptable units include:
 1. XD Expansion Deflection Coupling by Crouse-Hinds of Syracuse, N.Y.
 2. Type DF Expansion and Deflection fitting by Spring City Electrical Mfg. Co. of Spring City, PA.
- B. For conduit under 1 inch OD: Use "flexible" conduit with slack at least 3 feet or 15 diameters long, whichever is the longer or provide a flexible coupling as defined above.

2.3 ELECTRICAL BOX PADS.

- A. Equal to Lowry's Outlet Box Pads as manufactured by Harry A. Lowry Associates, Sun Valley, California.

2.4 EQUIPMENT FRAMES.

- A. General.

1. Mounting frames and/or brackets shall be provided to carry the load of the equipment without causing mechanical distortion or stress to the equipment.
- B. Frame Types.
1. Type WFB frame is a wide flange structural steel frame with brackets as shown on the drawings. The maximum allowable deflection of any point on the loaded frame relative to the unloaded frame shall be 0.005 inch. A wide flange section depth greater than 1/10th the length of the longest frame member will be accepted as satisfying the deflection requirement.
 2. Type CSB frame is a channel steel structural frame with brackets as shown on the drawings. The section depth shall be greater than 1/10th the length of the longest frame member.
 3. Type SBG frame is a steel bracket or gusset welded or bolted directly to the machine frame in order to accommodate the isolator.

2.5 SEISMIC RESTRAINTS.

- A. Vibration Isolated Distribution Panels.
1. Isolation mounts shall be provided with integral seismic restraints.

PART 3 - EXECUTION

3.1 INSTALLATION OF VIBRATION ISOLATION DEVICES.

- A. Transmission of perceptible vibration or structureborne noise to occupied areas by equipment installed under this Contract will not be permitted.
- B. Vibration isolators shall be installed per manufacturer's directions.
- C. Flexible electrical connections.
1. Installation of flexible electrical connections to vibration isolated equipment shall in no way impair or restrain the function of the aforementioned vibration isolation.
 2. Option 1: Install the flexible conduit in a grossly slack loop form or shallow "U" form. Install the stranded conductors with sufficient slack to accommodate maximum possible movement.
 3. Option 2: The flexible coupling shall be free and not in contact with any nearby building construction and shall be installed slack and free of strain in any direction. Install stranded conductors as above.
- D. All vibration isolation devices, including auxiliary steel bases shall be designed and furnished by a single manufacturer or supplier, who will be responsible for adequate coordination of all phases of this work.
- E. The vibration isolation manufacturer, or his representative, shall be responsible for providing such supervision as may be necessary to assure correct installation and adjustment of the isolators. Upon completion of the installation and after the system is put into operation, the manufacturer, or his representative, shall make a final inspection and submit his report to the Architect in writing, certifying the correctness of installation and compliance with approved submittal data.

3.2 OUTLET BOX PADS.

- A. All holes in outlet boxes in sound rated walls shall be completely covered with electrical box pads molded and pressed to the back side of the box.

3.3 COORDINATION.

- A. The contractor shall coordinate his work with other trades to avoid rigid contact between isolated equipment and raceways with the building. He shall inform other trades following his work to avoid any contact that would reduce the vibration isolation.

END OF SECTION 260700

SECTION 26 24 13 - SWITCHBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Scope of work required at existing main switchboards, rated 600 V and less.
 - 2. Overcurrent protective devices.
 - 3. Accessory components and features.
 - 4. Identification.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For existing switchboard equipment.
 - 1. Include ATS and new main circuit breaker bussing and wiring connection details, including required material used (i.e. for switchgear bus, main circuit breaker and wiring lugs connections) at existing switchgear equipment.
 - 2. Include time-current coordination curves for each type and rating of between the new main circuit breaker and the existing distribution circuit breakers protective devices within the existing switchboards.
- C. Field quality-control reports.
- D. Operation and maintenance data.
- E. Warrantee on new parts and components.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 2.
- C. Comply with NFPA 70.
- D. Comply with UL 891.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace any parts, devices and/or bussing that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED

- A. Contractor shall provide all labor, tools and material required to modify the existing main switchboard to accommodate the electrical connections of new main circuit breakers, switchboard existing bussing and new emergency generator system electrical distribution (i.e. new Automatic transfer switch and emergency standby generator set).
 - 1. Prior to bid and start of contract, Contractor shall field verify and examine the existing main switchboard installation, including contacting existing switchgear manufacturer determine all material required to modify the existing main switchboard for new electrical work required in this contract.

2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 800 A and larger.
 - 2. New Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. New main circuit breaker shall be Service-Rated type: Labeled for use as service equipment.
 - c. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.

2.3 INSTRUMENTATION

- A. Contractor shall maintain existing Power Company metering and Instrument transformers. All existing installation Comply with IEEE C57.13, NEMA EI 21.1 standards.

2.4 ACCESSORY COMPONENTS AND FEATURES

- A. Testing equipment: For testing functions of solid-state trip devices without removing from switchboard. Include relay and meter test plugs suitable for testing switchboard meters and switchboard class relays.

2.5 IDENTIFICATION

- A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Existing main switchboard equipment: At main switchboard contractor shall provide, install and connect new main circuit breaker (size as shown on plans).
- B. Comply with NECA 1.
- C. Comply with requirements for terminating feeder bus specified in Division 26 Section "Enclosed Bus Assemblies." Drawings indicate general arrangement of bus, fittings, and specialties.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Switchboard will be considered defective if it does not pass tests and inspections. Contractor shall repair and/or replace and defective part to make existing main switchboard electrically operable for owner use.
- D. Prepare test and inspection reports, including a certified report that identifies existing main switchboards parts and components. Certification report shall include and describes scanning results on all termination and connections. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

END OF SECTION 262413

SECTION 26 24 16 – PANEL BOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include wiring diagrams for power, signal, and control wiring.
 - 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.
- C. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- D. Field quality-control reports.
- E. Panelboard schedules for installation in panelboards.
- F. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Enclosures: Flush Surface Flush- and surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- C. Incoming Mains Location: Bottom or top – to suit site conditions.
- D. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus Configured Terminators: Mechanical type.
 - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.
- G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- H. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, and listed and labeled for series-connected short-circuit rating by an NRTL.
- I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- D. Mains: Circuit breaker.
- 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; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
- G. Branch Overcurrent Protective Devices: Fused switches.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Contactors in Main Bus: NEMA ICS 2, Class A, electrically held, general-purpose controller, with same short-circuits interrupting rating as panelboard.
 - 1. External Control-Power Source: 120-V branch circuit.
- F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- G. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- 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:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.

- C. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t 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 two-pole configurations with Class A ground-fault protection (6-mA trip).
 6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
 8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Communication Capability: Din-rail-mounted communication module with functions and features compatible with power monitoring and control system specified in Division 26 Section "Electrical Power Monitoring and Control."
 - f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75]percent of rated voltage.
 - g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handles in on or off position.
 - h. Handle Clamp: Loose attachment, for holding circuit-breaker handles in on position.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store and install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

- E. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- I. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection report, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

END OF SECTION 262416

SECTION 26 28 16 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Receptacle switches.
 - 4. Shunt trip switches.
 - 5. Molded-case circuit breakers (MCCBs).
 - 6. Enclosures.

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
- D. Field quality-control reports.
- E. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide equipment from one of the following manufacturers:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Type HD, Heavy Duty, Single Throw, 240 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - 4. Lugs: Suitable for number, size, and conductor material.
 - 5. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Lugs: Suitable for number, size, and conductor material.

2.3 RECEPTACLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy-Duty, Single-Throw Fusible Switch: 600-V ac, 100 A; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate specified fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- C. Type HD, Heavy-Duty, Single-Throw Nonfusible Switch: 600-V ac, 100 A; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Interlocking Linkage: Provided between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.

2.4 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

END OF SECTION 262816