Montgomery County Public Schools

Chairlift Modernization for

Walt Whitman High School

7100 Whittier Boulevard
Bethesda, MD 20817

Bid Specifications
02.28.2022

Project No: 18-12.38

Proffitt & Assoc.
ARCHITECTS

BID SPECIFICATIONS
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Walt Whitman High School
Chairlift Modernization
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Bethesda, Maryland 20817

SECTION 00 00 00
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Divisions 15 through 25

Not Used

Division 26 Electrical

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SECTION 01 10 00
SUMMARY OF WORK

PART 1 - GENERAL

1.1. SUMMARY

A. Unless otherwise noted, Contractor shall provide and pay for labor, materials, equipment, tools, construction machinery, transportation, and other facilities and services necessary for proper execution and completion of Work required by Contract Documents.

B. Work of Contract can be summarized by reference to Contract, General Conditions, specification sections as listed in "Table of Contents" bound herewith, drawings as listed in "Schedule of Drawings" bound herewith, addenda and modifications to Contract Documents issued subsequent to initial printing of project specifications and including but not necessarily limited to printed matter referenced by any of these. It is recognized that Work of Contract may be affected or influenced by governing regulations, natural phenomenon including weather conditions, and other forces outside Contract Documents. General contractor will be responsible for supervising and coordinating work that has to be performed by Contractor or Subcontractors.

C. General Contractor shall include all costs to perform and document inspections, observations, surveys, and measurements required to prepare complete and accurate As-Built Plans, provide required certifications, and obtain approval thereof from Montgomery County Department of Permitting Services in its bid.

D. This project includes removal and replacement of chairlift components to modernize an existing chairlift installation at Walt Whitman High School. Furnish all labor, materials, equipment, and services necessary for and incidental to the chairlift modernization scope of work described in spec section 14 20 00 including selective demolition of existing chairlift components, general building components, and replacement as further specified herein. All work shall be bid as lump sum as indicated on the drawings and specifications. Work shall be coordinated with the Owner and completed in the time frame dictated by the Owner. Work is further described as follows:

1. Site Summary: The existing site is home to Walt Whitman High School. The building will remain operational during construction of this project and will continue to operate in the same capacity after this project is complete. There is no sitework included in this project.

2. The Owner will be occupying the entire existing school building, following a normal school schedule for the 2021-2022 school year. All work of this project is to be complete prior to the start of the 2022-2023 school year. It is imperative that the Contractor understand the access, operational, safety and utility requirements of the Owner during the occupied periods. All work located on the interior and exterior of the building, and/or affecting occupied areas shall be completed at no disturbance to students or MCPS staff and teachers. Work at the existing building shall be completed during non-school hours – primarily over summer vacation, or as directed by the Owner. All utility outages shall be coordinated with the Owner and occur during unoccupied periods.

3. During the construction period, all deliveries and construction traffic must be coordinated with school activities and use.

4. New Work: is indicated on the contract documents and includes architectural and electrical work.
    a. Architectural work includes, but is not limited to, replacement of chairlift components and chairlift operating equipment, and repair and patching of any existing finishes or systems

damaged as a result of the work being performed. It includes removal and reconfiguration of existing stage platform, and provision of new flooring finish, base, and painting.

b. Select electrical upgrades are provided as required for connection and function of the new chairlift system.

1.2. WORK BY OWNER OF SEPARATE CONTRACTOR

A. Not Applicable

1.3. HOUSEKEEPING

A. Fire protection during construction

1. Provide and maintain hand fire extinguishers suitable for fire hazard involved at convenient accessible locations during construction.
   a. Provide each storage location with at least one approved portable fire extinguisher having a rating of not less than 20 - B: C.
   b. Place portable extinguishers rated not less than 2A so that maximum travel distance to the nearest exit shall not exceed 100 feet.
2. Avoid accumulation of flammable debris and waste within the building and vicinity. Avoid large and unnecessary accumulations of combustible forms and form lumber. Keep lumber stacked in an orderly manner.
3. Store flammable or volatile liquids in the open or in small, detached structures or trailers. Handle liquids with low flash points to be used within the building in approved safety cans. Supervise closely the storage of paint materials and other combustible finishing and cleaning products. Do not permit oily rags to be stored in closets or other tight permanent spaces.
4. Prohibit smoking on school property.
5. Closely supervise welding and torch cutting operations near combustible materials.
6. Supervise locations and operation of temporary portable heating units and fuel.
7. Use only fire-resistant building paper, plastic sheet, and tarpaulins for temporary protection.
8. Do not store combustible material outdoors within 10 feet of a building or structure.
9. Do not use gasoline for cleaning within the building under any circumstances.
10. Take other precautions suitable for hazardous conditions at the site to prevent fire.

B. Burning

1. Do not burn any trash or other material on site.

C. Clean Up

1. The contractor is responsible for cleanup of the adjacent rooms and areas used for next day's normal school activities that occur inside and outside the construction containment spaces. All cleaning is to be provided by a professional cleaning services contractor and OWNER only acceptable standard is "White Glove Clean."

1.4. SALVAGE RIGHTS

A. The contractor shall coordinate with the Owner on the disposal of salvageable items. The Owner has first rights to all salvageable materials. In order to avoid Owner induced delays, a duration limit of up to 5-7 working days for Owner's reclamation of salvage items shall apply unless written extension is submitted.

B. All items not claimed by the Owner for salvage shall become the responsibility of the Contractor for removal.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - SCHEDULE OF DRAWINGS

4.1 Drawings indicating Work to be performed under this Contract include:

GENERAL

A0.1 COVER SHEET

ARCHITECTURAL

CA1.0 OVERALL EXISTING EGRESS FLOOR PLAN

A1.1 EXISTING/DEMOLITION & PROPOSED FLOOR PLANS

A5.1 INTERIOR ELEVATION AND SECTION

ELECTRICAL

E0.1 ELECTRICAL LEGEND, ABBREVIATIONS, & CONVENTIONS

E1.1 PARTIAL FLOOR PLANS

- END OF SECTION 01 10 00 -

SECTION 01 33 00
SUBMITTALS

PART 1 - GENERAL

1.1 Summary:

A. Make submittals required by Contract Documents to Architect, and revise and resubmit as necessary to establish compliance with the specified requirements.

1.2 Related Sections:

A. Individual requirements for submittals may be described in Divisions 2 through 26 of these Specifications.

B. Maintain a record document set of approved submittal documents. See Section 01 78 10.

D. Submittals not required will not be reviewed by Architect.

E. Contractor may require Subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the Work, but such data shall remain between the Contractor and Subcontractors and will not be reviewed by Architect.

1.3 Quality Assurance:

A. Certifications: Provide such certification as is required per pertinent sections of these specifications. A minimum of two originals and one copy of Certification shall be forwarded.

1.4 Coordination of Submittals:

A. Prior to each submittal, carefully review and coordinate aspects of each item being submitted.

B. Verify that each item and submittal for it conform with the specified requirements.

C. Verify field measurements and conditions prior to submission.

D. By affixing Contractor's signature to each submittal, certify that coordination has been performed.

E. Each drawing submittal shall be certified by Contractor with the following stamp:

1. "This is to certify that specification requirements have been met and dimensions, conditions and quantities are verified as shown and/or corrected on these drawings."

Signed _____
Contractor

1.5 Submittals:

A. Make submittals of Product Data, Shop Drawings, Samples, and other items in accordance with the provisions of this Section.

PART 2 - PRODUCTS

2.1 Shop Drawings:

A. Upon signed release from the Contractor, Architect will make electronic copies of construction documents available for use as base sheet for providing coordinated Shop Drawings.

B. Scale and measurements: Make Shop Drawings accurately to a scale sufficiently large to show pertinent aspects of the item and its method of incorporation into Work.

C. Types of media required:

1. Submit Shop Drawings in the form of one original reproducible electronic copy of each drawing.

2. Unless absolutely necessary, the size of Shop Drawings shall not exceed 42" x 30". Provide space on Drawings for approval stamps and brief review comments.

3. Copies of architectural/engineering blueprints will not be accepted.

D. Review comments of the Architect will be shown on the reproducible drawing when it is returned to the Contractor. The Contractor may make and distribute such copies as are required for his purpose.

2.2 Product Data:

A. Manufacturers' data include catalogue cuts, technical descriptive brochures, performance charts, test reports, writing diagrams, details, specifications, and other printed information issued or provided by manufacturers. Data shall be submitted in electronic copies with physical plus 6 physical samples. Upon receipt, the Architect will review, stamp copies, and return to the Contractor. If resubmittal is necessary, repeat process until approval has been obtained.

B. Manufacturers' data for equipment includes materials, type, performance, characteristics, voltage, phase, capacity, and similar data. Provide wiring diagrams when applicable. Submittals shall indicate catalogue, model, and serial numbers representing specified equipment.

C. Where contents of submitted literature from manufacturers include data not pertinent to submittal, clearly show which portions of the contents is being submitted for review.

D. Provide material safety sheets to Owner for approval prior to releasing product for manufacture.

2.3 Samples:

A. Provide physical Samples of precise items proposed to be provided. Identify as described under "Identification of Submittals" below.

B. Number of Samples required:

1. Submit Samples in quantity, which is required to be returned, plus one which will be retained by Architect.

2. By prearrangement in specific cases, a single Sample may be submitted for review and, when approved, be installed in Work at a location agreed upon by Architect.

C. Colors and Patterns: Unless the precise color and pattern is specifically called out in Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit samples of accurate color and pattern, to Architect for selection.

2.4 Equipment Operating and Maintenance Data:

A. Provide Operating, Maintenance and Product data manuals as described in Section 01 78 20 of these Specifications.

2.5 Utility Approvals:

A. Approval of utilities or other public authorities having jurisdiction shall be obtained and reflected on affected submittals.

PART 3 - EXECUTION

3.1 Deviations from Contract Documents:

A. Clearly mark deviations in a conspicuous manner indicating component and system variations, additions and deletions, revised equipment locations, construction detail variations, substitutions, and similar changes or deviations. Indicate headroom heights, ceiling heights, clearances, and other dimensions affected by proposed deviations. Variations from Contract Documents not brought to the attention of Architect shall be the sole responsibility of Contractor even though such submittal has been accepted.

3.2 Identification of Submittals:

A. Submittals shall be numbered using the specification section number, followed by a dash, plus a sequential numerical identifier.

1. When material is resubmitted for any reason, transmit under a new letter of transmittal and with original transmittal number and letter designation beginning with "A".

2. Changes should be clearly designated as to revisions made. No consideration will be allowed for submittal revision labor made to coordinate revised, changed, adjusted details or extent.

B. Accompany each submittal and resubmittal with a letter of transmittal showing information required for identification and checking. Letter of transmittal should refer to applicable drawing numbers, specification sections and submittal schedule item number to which each submittal applies.

C. On at least the first page of each submittal, and elsewhere as required for positive identification, show submittal number in which item was included.

D. Each submittal should indicate supplier/installer's name, phone number and specific location(s) of submitted product in project.

E. Maintain an accurate submittal log for duration of Work, showing current status of submittals at all times. Make submittal log available to Architect for review upon request. List submittals and resubmittals together.

3.3 Grouping of Submittals:

A. Unless otherwise specified, make submittals in groups containing associated items to ensure that information is available for checking each item when it is received.

1. Partial submittals unless approved in advance by Architect may be rejected as not complying with provisions of Contract.

2. Contractor may be held liable for delays so occasioned.

3.4 Timing of Submittals:

A. Contractor shall submit within fifteen (15) calendar days of Contract award a submittal schedule listing items by number and dates of submittal, and lead time for each item with particular note of priority items to be reviewed. Submittals shall be submitted in an orderly sequence with priority items clearly identified.

B. A complete list of material and other required information in connection with electrical Work of project (plumbing, heating, ventilating, air conditioning, electrical), as listed under respective electrical Specification Sections, must be submitted within fifteen (15) calendar days after date of Notice to Proceed; no consideration will be given to partial lists submitted from time to time.

C. Other submittals by Contractor should be made within thirty (30) calendar days of Notice to Proceed and far enough in advance of scheduled dates for installation to provide time required for reviews.

D. Where Contractor has neglected to submit shop drawings on a timely basis or to place orders for materials and labor early enough to conform to materials and labor requirements, color schemes, etc., such failure shall not be deemed as legitimate cause for delay.

E. In scheduling, allow at least fourteen (14) working days for review by Architect following receipt of the submittal. The following submittals will, by their nature, require additional time for review which should be factored into the schedule.

1. Chairlift

3.5 Architect's Review:

A. Review by Architect does not relieve the Contractor from responsibility for errors which may exist in submitted data.

B. Revisions:

1. Make revisions required by Architect.

2. If Contractor considers required revisions to be a change, notification shall be given to Architect as provided for in General Conditions.

3. Make only those revisions required to obtain approval by Architect.

C. Architect's approval:

1. Until approval has been given by Architect, materials or items shall not be fabricated or incorporated in Work. Architect's approval will be only general in nature and shall not be construed as permitting departure from Contract requirements, or as relieving Contractor of responsibility for any errors concerning details, dimensions, materials, etc. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, Contractor shall describe such variation in letter of transmittal. If acceptable, Architect may approve variations, subject to proper adjustment in Contract price. If Contractor fails to describe such variation, Contractor

shall not be relieved of responsibility for executing Work in accordance with Contract, even though such drawings have been approved.

2. Acceptance shall not be construed as a complete check but will indicate only that design, fabrication, and detailing is consistent with design intent and that errors and discrepancies observed when reviewed have been noted. Acceptance of a separate item shall not be interpreted as an approval of an assembly in which the item functions. The Owner or Architect reserves the right to require submission of additional detail, shop, erection or setting drawings and of any schedules for any part of Work, whether or not specifically mentioned in Project Specifications, where substitutions or modifications are proposed by Contractor, or where such information is essential to proper assembly, coordination, or execution of Work under Contract.

3. Review and acceptance shall not relieve the Contractor from responsibility for errors in shop drawings or for proper coordination assembly of materials and equipment with other Work, nor from responsibility of furnishing materials and labor not indicated on approved shop drawings but required by Contract Documents for completion of Work.

- END OF SECTION 01 33 00 -

SECTION 01 78 10
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 Summary:

A. Throughout progress of Work, maintain an accurate record of changes in Contract Documents.

B. Upon completion of Work, transfer recorded changes to a set of Final Project Record Documents.

1.2 Related Sections:

A. Documents affecting Work of this Section include General Conditions and Sections in Division 1 of these Specifications.

B. Other requirements affecting Project Record Documents may appear in pertinent other Sections of these Specifications.

1.3 Quality Assurance:

A. Delegate responsibility for maintenance of Record Documents to one person on Contractor's staff as approved by the Architect.

B. Accuracy of records:

1. Thoroughly coordinate changes within Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to show change properly.
2. Accuracy of records shall be such that a future search for items shown in Contract Documents may rely reasonably on information obtained from Project Record Documents.
3. Make entries within 72 hours after receipt of information that change has occurred.

C. Product Handling:

1. Maintain Job Set of Record Documents completely protected from deterioration and from loss and damage until completion of Work and transfer of recorded data to final Project Record Documents.
2. In event of loss of recorded data, use means necessary to again secure data to the Architect's approval.
3. Such means shall include, if necessary, in opinion of the Architect, removal and replacement of concealing materials.
4. In such case, provide replacements to standards originally required by Contract Documents.

1.4 Submittals:

A. Comply with pertinent provisions of Section 01 33 00.

B. Architect's approval of current status of Project Record Documents will be a prerequisite to the Architect's approval of requests for progress payment and request for final payment under Contract.

C. Prior to submitting each request for progress payment, secure the Architect's approval of current status of Project Record Documents.

D. Prior to submitting request for final payment, submit final Project Record Documents to the Architect and secure approval.

PART 2 - PRODUCTS

2.1 Job Set:

A. Promptly following receipt of Owner's Notice to Proceed, secure from Architect at no charge to Contractor one complete conforming set of Documents comprising Contract.

2.2 Final Project Record Documents:

A. The purpose of Final Project Record Documents is to provide factual information regarding aspects of Work, both concealed and visible, to enable future modifications of Work to proceed without lengthy and expensive site measurement, investigation, and examination. The document set shall include:

1. Final Record Drawings: At a time nearing completion of Work, transfer information from Job Set to Final Record Drawings.
2. Specifications: At a time nearing completion of Work prepare Specification Sections received from Architect with revisions and addenda added.
3. Submittal Set: At a time nearing completion of Work, as per Section 01 33 00, prepare approved submittal documents for review including revisions if any.
    a. Collect approved submittal documents and prepare an index including following information:
        1) Specification Section
        2) Date approved
        3) Submittal number
        4) Brief description
    b. Index shall be organized per Specification Section.

PART 3 - EXECUTION

3.1 Job Set:

A. Immediately upon receipt of conforming set described above, identify each Document with title, "RECORD DOCUMENTS - JOB SET."

B. Preservation:

1. Consider number of occasions upon which Job Set must be taken out for new entries and for examination, and conditions under which these activities will be performed, devise a suitable method for protecting Job Set for approval of the Architect.
2. Do not use Job Set for any purpose except entry of new data and for review by the Architect, until start of transfer of data to Final Project Record Documents.
3. Maintain Job Set at site of Work as that site is designated by the Architect.

C. Making entries on drawings:

1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe change by graphic line and note as required.
2. Date entries.
3. Call attention to entry by a "cloud" drawn around area or areas affected.

4. In event of overlapping changes, use different colors for overlapping changes.

D. Make entries in pertinent other Documents as approved by the Architect.

E. Conversion of schematic layouts:

1. In some cases, on Drawings, arrangements of conduits, circuits, piping, ducts, and similar items, are shown schematically and are not intended to portray precise physical layout.

a. Contractor determines final physical arrangement, subject to the Architect's approval.

b. However, design of future modifications of facility may require accurate information as to final physical layout of items which are shown only schematically on Drawings.

2. Show on Job Set of Record Drawings, by dimension accurate to within one inch, the centerline of each run of items such as are described in subparagraph 3.1-E-1 above.

a. Clearly identify item by accurate note such as "cast iron drain," "galv. water," etc.

b. Show, by symbol or note, vertical location of item ("under slab," "in ceiling plenum," "exposed," etc.).

c. Make identification sufficiently descriptive that it may be related reliably to Specifications.

3. Architect may waive requirements for conversion of schematic layouts where, in Architect's judgment, conversion serves no useful purpose. However, do not rely upon waivers being issued except as specifically issued in writing by Architect.

3.2 Final Project Record Documents:

A. Approval of recorded data prior to transfer:

1. Following receipt of transparencies described above, and prior to start of transfer of recorded data thereto, secure the Architect's approval of recorded data.

2. Make required revisions.

B. Transfer of data to Drawings:

1. Carefully transfer change data shown on Job Set of Record Drawings to corresponding final record drawings, coordinating changes as required.

2. Clearly indicate at each affected detail and other Drawing a full description of changes made during construction, and actual location of items described above.

3. Call attention to each entry by drawing a "cloud" around area or areas affected.

4. Make changes neatly, consistently, and with proper media to assure longevity and clear reproduction.

C. Transfer of data to other Documents:

1. If Documents other than Drawings have been kept clean during progress of Work, and if entries thereon have been orderly to approval of the Architect, Job Set of those Documents other than Drawings will be accepted as final Record Documents.

2. If any such Document is not approved by the Architect, secure a new copy of that Document from Architect at Architect's usual charge for reproduction and handling, and carefully transfer change data to new copy for approval of the

Architect.

D. Review and submittal:

1. Submit completed set of Final Project Record Documents to the Architect as described above.
2. Participate in review meetings as required.
3. Make required changes and deliver Final Project Record Documents to the Architect within 30 calendar days of substantial completion.
4. Submittal of Final Project Record Documents shall be in following formats:
   a. Final record drawings: One copy final record drawings in bond paper, and two in scanned digital format. The original pre-scanned documents shall be black print on bond paper.
   b. Specifications: One copy 20 lb. bond white paper and scanned digital format.
   c. Submittal documents: Scanned digital format.
   d. O & M manual – Two copies 2016. bond white paper and two copies in scanned digital format.
   e. Mechanical video demonstration: three copies in DVD format.
5. Scanned digital formats shall comply with following:
   a. For drawings:
      1) File type: TIFF Version 6.0 with LZW Compression
      2) Automatic despeckling at 7-pixel settings, unless other settings provide better legibility with prior approval by MCPS.
      3) Deskewing, cropping and rotation (landscape view optimum right angles)
      4) Attended scanning with maximized readability adjustments performed per sheet.
   b. For specifications, submittals, and operating, maintenance and product data:
      1) File type: PDF version 1.7 (ISO 32000-1:2008) compatible with Adobe Acrobat 8.0 or higher
      2) Invert to be upright.
   c. Scanned images are to be stored in CD ROM disk (ISO 9660). Provide two copies.
   d. Prior to scanning, provide sample image of a typical sheet for approval by MCPS. Scanning service shall notify MCPS, Division of Maintenance of any probable illegible scans. Final file name format to be approved by MCPS, Division of Maintenance. For quantity, Contractor shall assume total number of Contract Drawings plus 10%. The final acceptable quality of scans shall be at the discretion of MCPS. It is intended that information on scans be legible.

e. Electronic directory structure shall include root directory with school name and subdirectories as follows:

1) school name\drawings\ (each drawing shall be a separate file and file name shall be named to match sheet number -with sheet title - i.e., C1 Site Plan.)

2) school name\specifications\ (entire specification shall be a single PDF file with a table of contents included with bookmarks to each specification section)

3) school name\submittals\ (all submittals shall be a single PDF file with a table of contents included with bookmarks to each specification section and individual submittal)

4) school name\om_manual\ (entire O&M manual shall be a single PDF file with a table of contents included with bookmarks to each specification section)

f. Organize specifications, submittals, and O&M manual documents as follows:

1) Specifications - set up with a table of contents in same order as CSI master format using specification section number and name in table of contents. (i.e., Section 14 20 20 – Elevators and Lifts).

2) Submittals - set up with a table of contents in same order as CSI master format using specification section number, title of submittal, and submittal number in table of contents. (i.e., Section 14 20 00 – Wheelchair Lifts - Submittal No. 1).

3) O&M Manuals - set up with a table of contents in same order as CSI master format using specification section number and title of item described in table of contents. Also, list name of subcontractor (i.e., Section 14 20 00 – Wheelchair Lifts)

6. Retention reduction from 5 percent will not be made until all of Record Documents have been received.

E. Changes Subsequent to Acceptance:

1. Changes to the Record Documents, including those resulting from Work performed under Warranty shall be provided in a Supplemental Submission. Contractor has no responsibility for recording changes in Work subsequent to Final Completion.

- END OF SECTION 01 78 10 -

SECTION 01 78 20

OPERATING, MAINTENANCE AND PRODUCT DATA

PART 1 - GENERAL

1.1 Summary:

A. To aid continued instruction of operation and maintenance personnel, and to provide a positive source of information regarding the products incorporated into Work, furnish, and deliver the described in this Section and in pertinent other Sections of these Specifications.

B. General Contractor shall organize all submissions into one organized set of Operations and Maintenance manuals in CSI format.

1.2 Related Sections:

A. Documents affecting Work of this Section include General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

B. Required contents of submittals also may be amplified in pertinent other Sections of these Specifications.

1.3 Quality Assurance:

A. In preparing data required by this Section, use only personnel who are thoroughly trained and experienced in operation and maintenance of described items, completely familiar with requirements of this Section, and skilled in technical writing to extent needed for communicating essential data.

1.4 Submittals:

A. Comply with pertinent provisions of Section 01 33 00 "Submittals".

B. Submit one copy of completed data in final form at time of Substantial Completion inspection.

Copy will be returned after final inspection or acceptance, with comments.

C. Submit three (3) copies of approved data in final form ten (10) working days before Final Application for Payment.

PART 2 - PRODUCTS

2.1 Where instruction Manuals are required to be submitted under other Sections of Specifications, prepare in accordance with provisions of this Section.

2.2 Format:

A.	Size:	8-1/2 inches x 11 inches
B.	Paper:	White bond, at least 20 lb. weight
C.	Text:	Neatly written or printed at maximum of 12 cpi
D.	Drawings:	11 inches in height preferable; bind in with text; foldout acceptable but fold to fit within Manual and provide a drawing pocket inside rear cover or bind in with text.
E.	Flysheets:	Separate each portion of Manual with neatly prepared flysheets briefly describing contents of ensuing portion; flysheets may be in color.

F. Binding: Use commercial quality 3-ring binders with durable and cleanable plastic covers. Maximum ring size will be 2 inches. When multiple binders are used, correlate data into related consistent groupings.

G. Measurements: Provide measurements in U.S. standard units such as feet-and-inches, lbs., and cfm; where items may be expected to be measured within ten years in accordance with metric formulae, provide additional measurements in "International System of Units" (SI).

H. Digital Media: Provide two copies of Information in manual as scanned digital format as specified in Section 01 78 10 "Project Record Documents".

I. Provide front and back covers for each Manual, using durable material approved by the Architect, and clearly identified on or through cover with at least following information:

OPERATING AND MAINTENANCE INSTRUCTIONS
(
(Name and address of Work)
(
(Name of Contractor)
(
(General name of this Manual)
(
(Space for approval signatures of the)
(Architect)
(and approval data)

J. Contents: Include the following:

1. Neatly typewritten index near front of Manual, giving immediate information as to location within Manual of emergency information regarding installation.
2. List of all Contractors, Subcontractors, and suppliers with complete name of firm, subsidiary, etc.; address, telephone number, and principal contact person.
3. Complete instructions regarding operation and maintenance of mechanical and electrical systems equipment involved including lubrication, disassembly, and reassembly.
4. Complete nomenclature of mechanical and electrical system parts and equipment.
5. Complete nomenclature and part number of replaceable parts, name and address of nearest vendor, and other data pertinent to procurement procedures.
6. Complete operating, maintenance, cleaning and product data for every finish material and product contained in finished project, including the following:
   a. Resilient Flooring
   b. Painting
   c. Chairlift Components and Equipment
   d. Electrical Equipment
7. Copy of guarantees and warranties issued.
8. Manufacturers' bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, manufacturers' data with which this installation is not concerned.
9. Color Schedules.
10. Such other data as required in pertinent Sections of these Specifications.

PART 3 - EXECUTION

3.1 Preliminary:

A. Prepare a preliminary draft of each proposed Manual.

B. Show general arrangement, nature of contents in each portion, probable number and size of drawings, and proposed method of binding, covering and digital format.

C. Secure Architect's approval prior to proceeding.

3.2 Final:

A. Complete Manuals in strict accordance with approved preliminary drafts and Architect's review comments.

3.3 Revisions

A. Following indoctrination and instruction of operation and maintenance personnel, review proposed revisions of the Architect.

B. If Contractor is required by the Architect to revise previously approved Manuals, compensation will be made as provided for under "Changes" in General Conditions.

- END OF SECTION 01 78 20 -

SECTION 01 78 60
WARRANTIES AND BONDS

PART 1 – GENERAL:

1.1 Summary:

A. Compile specified warranties, bonds, and maintenance contracts and submit to the Architect. Warranties will commence no earlier than date of Substantial Completion.

1.2 Related Sections:

A. Documents affecting Work of this Section include General Conditions, other Sections of Division 1 and detailed requirements documented in each respective section of Divisions 2 through 26 of Specifications.

B. Certifications and other commitments and other agreements for continuing services to Owner as specified elsewhere in Contract Documents.

1.3 Definitions:

A. Standard project warranties are preprinted written warranties published by individual manufactures for particular products and are product and are specifically endorsed by manufacturer to Owner.

B. Special warranties are written warranties required by or incorporated in Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for Owner

1.4 Quality Assurance:

A. Use adequate care and diligence to thoroughly review Contract Documents to identify detailed requirements relating to warranties and bonds.

B. Verify that each item required for this submittal conforms with specified requirements.

1.5 Submittals:

A. Comply with pertinent provisions of Section 01 33 00 “Submittals” and part 3 below.

PART 2 - PRODUCTS:

2.1 Description of Warranty Requirements:

A. In addition to standard and special warranties described in Divisions 2 through 26, Contractor shall warrant Work included in this project, for a minimum period of two (2) year following acceptance of a Certificate of Substantial Completion by Owner, to cover performance, material, workmanship, and compliance with Contract Documents.

B. Manufacturer’s disclaimers and limitations on product warranties do not relieve Contractor of warranty on Work that incorporates products, nor do they relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with Contractor.

C. Related Damages and losses: When correcting warranted work that has failed, remove, and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of Warranted Work.

D. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate warranty by written endorsement. Reinstated warranty shall be equal to original warranty with an equitable adjustment for depreciation.

E. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. Contractor is responsible for cost of replacing or rebuilding defective Work regardless of whether Owner has benefited from use of Work through a portion of its anticipated useful service life.

F. Owner's Recourse: Written warranties made to Owner are in addition to implied warranties, and shall not be limit duties, obligations, rights, and remedies otherwise available un- der law, nor shall warranty periods be interpreted as limitations on time in which Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: Owner reserves right to reject warranties and to limit selections of products with warranties not in conflict with requirements of contract Documents.

G. Owner reserves right to refuse to accept Work for project where a special warranty, certification, of similar commitment is required on such Work or part of Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

PART 3 – EXECUTION:

3.1 Warranties and Bonds:

A. Assemble warranties bonds and service and maintenance contracts, executed by each respective manufacturer, supplier, and contractor.

B. Submit written warranties to the Architect prior to date established for Substantial Completion. If Certificate of Substantial Completion designates a commencement date for warranties other than date of Substantial Completion, or a designated portion of Work, submit written warranties upon request of the Architect.

C. When a designated portion of Work is completed and occupied or used by Owner, by separate agreement with Contractor during construction period, submit properly executed warranties to Architect within fifteen days of completion of that designated portion of Work.

D. When a special warranty is required to be executed by Contractor, or Contractor and a subcontractor, supplier, or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by required parties. Submit a draft to Owner to the Architect for approval prior to final execution.

3.2 Form of Submittals:

A. At Final Completion compile two copies of each required warranty and bond properly executed by Contractor, subcontractor, supplier, or manufacturer. Organize warranty documents into an orderly sequence based on table of contents of Project Manual.

B. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 81/2" by 11" paper.

C. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark tab to identify product or installation. Provide a typed description of product or installation, including name of product, and name, address, and telephone number of installer.

D. Identify each binder on the front and the spine with typed or printed title "WARRANTIES AND BONDS," Project title or name, and name of Contractor.

E. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

F. Digital Media: Provide one copy scanned digital format as specified in Section 01 78 10 "Project Record Documents".

3.3 End of Warranty Inspection:

A. Each warranty shall include a provision to allow for extension at Contractor's expense if end of warranty inspection is not scheduled before end of warranty period.

- END OF SECTION 01 78 60 -

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Demolition and disposal of existing site and building elements as specified in the Contract Documents.

1.2 RELATED SECTIONS

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

1.3 DEFINITIONS

A. Remove & Dispose: Remove to and approved off site facility and legally dispose of any items noted as such in the contract documents, except those items indicated otherwise.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.

C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 SUBMITTALS FOR REVIEW

A. Proposed dust-control measures.

B. Proposed noise-control measures.

C. Schedule of selective demolition activities indicating the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.

D. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.

E. Landfill records indicating receipt and acceptance of all wastes by a landfill facility licensed to accept such wastes.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable code for demolition work and dust control.

B. Obtain required permits from authorities.

C. Do not close or obstruct egress width to any building or site exit. Do not close or obstruct roadways.

D. Conform to procedures applicable when hazardous or contaminated materials are discovered.

E. Conform to applicable code for demolition of structures, safety of adjacent structures, dust control, runoff control, and disposal.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition Work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Pre-demolition Conference: Conduct conference with Owner at Project site prior to beginning demolition work.

1.7 PROJECT CONDITIONS

A. Owner assumes no responsibility for actual condition of buildings to be selectively demolished.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Storage or sale of removed items or materials on-site will not be permitted unless agreed upon in advance by the Owner.

D. Conduct demolition to minimize interference with adjacent and occupied building areas.

E. Cease operations immediately if structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

F. Existing Utilities: Locations of existing utilities are approximate. Locations have been determined from field survey, public utility records and Owner records.

1. Contractor shall be responsible for contacting "Miss Utility", Owner or controlling agencies of existing utilities within construction area for verification of locations and marking of utilities, prior to beginning of work.

2. Contractor shall be responsible for coordination of utility relocation or removal by others with phases of construction activities.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

B. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

C. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate, and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.

D. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 PREPARATION

A. Provide, erect, and maintain temporary barriers as required for phasing and to maintain occupancy of building during construction.

B. Erect and maintain weatherproof closures for exterior openings.

C. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise.

D. Protect existing materials and which are not to be demolished.

E. Prevent movement of structure; provide bracing and shoring.

F. Provide appropriate temporary signage including signage for exit or building egress.

G. Protect existing landscaping materials which are not to be demolished.

H. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

I. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction. Install temporary barriers between work areas and occupied areas of the building to prevent the spread of dust.

2. Protect existing site improvements, appurtenances, and landscaping to remain.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.

4. Cover and protect equipment that has not been removed.

3.3 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent structures.

B. Cease operations immediately if adjacent structures appear to be in danger. Notify Architect/Engineer. Do not resume operations until directed.

C. Conduct operations with minimum interference to public or private access points. Maintain egress and access at all times.

D. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.

E. Sprinkle Work with water to minimize dust as appropriate. Provide hoses and water for this purpose.

F. Demolish in an orderly and careful manner. Protect existing supporting structural members and utilities to remain. Maintain weathertight and secure enclosure of existing building at all times.

G. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option. Do not burn or bury materials on site. Leave site in clean condition.

H. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition, and in orginal configuration unless directed otherwise by the owner.

I. Remove temporary Work and restore existing building to its original condition unless directed otherwise by the owner.

3.4 POLLUTION CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.5 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:

1. Dispose of demolished items and materials promptly.

2. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Sweep the building broom clean on completion of selective demolition operation.

- END OF SECTION 02 41 19 -

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated ferrous metal items.

1.2 RELATED SECTIONS

A. Section 09 90 00 – Painting: Painted finish.

1.3 REFERENCES

A. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.

B. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM A283 - Carbon Steel Plates, Shapes, and Bars.

D. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

E. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

F. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

G. AWS D1.1 - Structural Welding Code.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Division 1.

B. Shop Drawings: Submit shop drawings indicating profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Include calculations for design of railings. Shop drawings and calculations shall be completed under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Maryland.

C. Indicate welded connections using standard AWS 2.0 welding symbols. Indicate net weld lengths.

1.5 DESIGN/PERFORMANCE REQUIREMENTS

A. Handrails Not Serving as Top Rails: Shall withstand the following loads:

1. Concentrated load of 200 lbf (0.89 kN) applied at any point and in any direction.
2. Uniform load of 50 lbf-ft (0.07kN-m) applied in any direction
3. Concentrated and uniform loads above need not be assumed to act concurrently.

1.6 QUALIFICATIONS

A. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the place where the Project is located in the State of Maryland.

B. Welders Certificates: Submit under provisions of Section 01 33 00, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

PART 2 - PRODUCTS

2.1 MATERIALS - STEEL

A. Recycled content of steel members - Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than the following:

1. W-Shapes, Channels and Angles: 60 percent.
2. Plate, Bar, Cold-Formed Hollow Structural Sections, and Steel Pipe: 25 percent.
3. All Other Steel Materials: 25 percent.

B. Steel Sections: ASTM A992.

C. Steel Tubing: ASTM A500, Grade B.

D. Plates: ASTM A283.

E. Pipe: ASTM A53, Grade A or B as noted below, Schedule 40.

F. Bolts, Nuts, and Washers: ASTM A325 galvanized to ASTM A153 for galvanized components.

G. Welding Materials: AWS D1.1; type required for materials being welded.

H. Ladders: ANSI A14.3.

I. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

J. Wire Cloth: 1” square, #8-gauge wires, powder coat, color as selected by Architect.

2.2 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Railings: Provide stainless steel pipe railings as indicated on the drawings.

1. Railings may be bent at corners instead of joining, provided the bends are uniformly formed in jigs, with cylindrical cross section of pipe maintained throughout the entire bend. Joints

in railings and between railings and fittings are to be welded and carefully ground smooth. The finish of handrail welds must be completely seamless and invisible.

2. Secure handrails to walls by means of wall brackets, and wall return fitting at handrail ends, as detailed. Finished railings shall clear wall finishes by a minimum of 2 ¼" to provide hand room. Wall brackets shall be fitted with fully concealed fasteners. All surfaces shall be smooth to the touch. All wall rails shall return to walls at ends with a snap-on flange at the wall.

2.3 FABRICATION TOLERANCES

A. Squareness: 1/8-inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation from Plane: 1/16 inch in 48 inches.

2.4 FINISHES - STEEL

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime paint items with one coat.

D. After fabrication, galvanize all members to be exposed to the elements or called out on the drawings as galvanized to ASTM A123. Provide minimum 1.25 oz/sq ft galvanized coating.

E. Powder coat fabricated elements as indicated on the drawings; color as selected by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Do not begin installation until substrates have been properly prepared.

C. Examine system components, substrate, and condition where railing systems are to be installed.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

C. Clean surfaces thoroughly prior to installation.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated on shop drawings.

D. Perform field welding in accordance with AWS D1.1.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

G. Secure railing to masonry wall with 3/8” double expansion bolts into solid CMU or completely thru-bolts.

3.4 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset from True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.5 FIELD QUALITY CONTROL/TESTING

A. Field inspection and testing will be performed under provisions of Division 1. The Contractor shall retain a third-party testing agency to perform all testing and inspections required. See listing of acceptable testing agencies in Section 01 45 00.

3.6 CLEANING

A. Remove temporary coverings and protection of adjacent work areas.

B. Clean railing system promptly after installation in accordance with manufacturer's instructions.

C. Do not use harsh cleaning materials or methods that would damage finish. Do not use abrasive cleaners.

3.7 PROTECTION

A. Protect installed products until completion of project. Provide plastic sheet protection for all surfaces of completed installations to prevent damage during remainder of construction activities.

B. Replace defective or damaged components as directed by Architect.

C. Touch-up, repair or replace damaged products before Substantial Completion.

3.8 SCHEDULE

A. The following Schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.

1. Metal guardrails and handrails.

- END OF SECTION 05 50 00 -

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Requirements of the General Conditions, Supplementary Conditions, and Division 1 of these specifications apply to this Section.

B. Include all labor, materials, appliances, and services necessary to complete all rough carpentry and related work required by the drawings and/or described in this specification.

C. Generally: Concealed or temporary woodwork; rough and general carpentry duties; necessary wood framing, blocking, sheathing, finishing, trimming, and working of wood or wood fibered materials; all rough carpentry, preparatory work, bracing, propping, protection and boxing, all wood framing, grounds, bucks, wood blocking, furring, and all other general carpentry work. All wood plates as shown on the drawings. All wood blocking required by job conditions.

1.2 RELATED SECTIONS

A. Section 06 20 23: Interior Finish Carpentry

1.3 REFERENCES

A. ALSC: American Lumber Standards Committee - Softwood Lumber Standards.

B. APA: American Plywood Association.

C. AWPA (American Wood Protection Association): C1 – All Timber Products Preservative Treatment by Pressure Process.

D. NFPA: National Forest Products Association.

E. SPID Southern Pine Inspection Bureau.

F. ASTM D 2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

H. AWPA C20 - Structural Lumber -- Fire Retardant Treatment by Pressure Processes; American Wood-Protection Association.

I. AWPA C27 - Plywood -- Fire-Retardant Treatment by Pressure Processes; American Wood-Protection Association.

J. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood-Protection Association.

K. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce).

1.4 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data: Provide list of lumber grades and sizes proposed for use and technical data on panel products.

C. Product Data: Provide technical data on wood preservative materials and application instructions.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the following agencies:

1. Lumber Grading Agency: Certified by ALSC.

2. Plywood Grading Agency: Certified by APA.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Lumber:

1. Non-Load Bearing Members: Standard Grade Douglas Fir, Western Larch, Western Hemlock (WWPA or WCLA) or #2 Dimension Southern Pine (SPIB).

2. Blocking: No. 2 Common Grade of any WWPA or WCLA species or No. 2 Southern Pine Boards (SPIB). Blocking shall include any wood material, without regard to size or length, which is required for the secure fastening, stiffening, anchoring, or hanging of any cornice, soffit, eaves, water table, cabinet, counter, or attainment of any profile shall be provided of proper strength to fully secure or support as if fully detailed or specified.

3. Wood blocking or nailers on steel framing shall be bolted thereto. Wood grounds shall also be provided for securing equipment furnished under other Sections of these specifications. Provide block nailers as required for sheet metal work. Blocking adjacent to roof insulation shall be full thickness of insulation and shall finish flush with top surface.

4. Size and Shapes: Nominal sizes shown and specified refer to undressed lumber dimensions. Dress lumber 4 sides (S4S) unless otherwise shown or specified, in accordance with the requirements of the West Coast Lumber Inspection Bureau, Grading and Dressing Rules, worked to shapes and patterns shown. All lumber shall be kiln-dried to a moisture content not to exceed 19 percent.

5. All wood blocking shall be fire retardant treated.

6. Plywood Sheathing: thickness as indicated on the drawings, fire retardant treated as indicated on the drawings and/or as required by local Codes.

2.2 ACCESSORIES

A. Fasteners and Anchors:

1. Fasteners: Hot-dipped galvanized steel for high humidity, exterior or exposed to weather, and treated wood locations, unfinished steel elsewhere.

2. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt for anchorages to steel.

3. Furnish all rough hardware, nails, spikes, bolts, screws, staples, straps, etc., that are required for proper assembly of building components and materials.

2.3 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

   2. Basis-of-Design: Hoover-X by Hoover Treated Wood Products, Inc.: www.frtw.com.

B. Fire Retardant Treatment (FRT):
   1. Exterior Type: AWPA Use Category UCFB, Commodity Specification H (Treatment C20 for lumber and C27 for plywood), chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E 84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D 2898.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat all exterior rough carpentry items.
      c. Do not use treated wood in direct contact with the ground.
      d. Treat wood blocking installed in built-up thickness for roofing terminations except top layer in direct contact with roofing membrane.

   2. Interior Type A: AWPA Use Category UCFA, Commodity Specification H (Treatment C20 for lumber and C27 for plywood), low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E 84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat rough carpentry items as indicated.
      c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

PART 3 – EXECUTION

3.1 INSPECTION

A. Inspect all wood and other materials.

B. Sort out and discard damp, warped or damaged material which would not provide consistent substrates or Underwriters Label Construction as herein specified.

3.2 INSTALLATION

A. Wood blocking shall be installed as indicated on the drawings to provide an integral component for adjacent structural or architectural materials.

   1. Blocking shall be erected true and with tight joints to provide a consistent substrate for surface materials, framing or roof framing. Use the longest lengths practical to minimize jointing.

B. Install wood framing as indicated on the drawings. Wood framing shall be erected plumb and true and firmly anchored to supporting structures, as indicated on the drawings, to provide a consistently secure strong substrate for covering work. Install blocking, nailers and bridging as required for secure fastening of surface materials and to minimize the flexibility of framing components. Blocking shall be placed four (4) feet on center maximum. All framing and blocking shall be built so that sheathing or finish work joints shall fall on the center of framing or blocking.

   1. Set members level and plumb, in correct position.

   2. Place horizontal members flat, crown side up.

   3. Construct curb members of single pieces.

   4. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

   5. Coordinate curb installation with installation of work of other trades.

C. All wood bucks, blocks, bolts, anchors, etc., shall be furnished and set for building into masonry walls and partitions. All temporary and permanent wood bucks and sub-bucks shall be erected, and all plates, blocking, grounds, furring, stripping, screeds, nailers, etc., shall be securely installed at proper times to suit progress of construction.

D. Fit carpentry work to other work. Scribe and cope as required for accurate fit. Set carpentry work accurately to required levels and lines with members plumb and true and accurately cut and fitted. Shim with metal or slate for full bearing on concrete or masonry substrates. Set true to line and level, plumb, with intersections true to required angle. Build into masonry as work progresses, cutting to fit masonry unit size involved. Anchor to formwork before concrete placement.

E. Wood Grounds: Provide wood grounds and blocking of size and shape required for securing trim and attaching other work in place. Set grounds true to line, level or plumb and secure firmly in place. Grounds generally will be dressed square edged, pressure treated and of a thickness required for substantial anchorage and fastening to substrate and remaining flush with adjacent finish surfaces.

- END OF SECTION 06 10 00 -

SECTION 09 90 00

PAINTING AND COATING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Paint or natural finish all interior surfaces not specifically excluded. Includes:

   a. All areas indicated on the drawings and included in the schedule noted to be painted.

   b. Exposed mechanical and electrical items in areas to be painted.

2. Paint exposed surfaces not factory finished on exterior and interior materials as determined necessary by project Architect to achieve required material protection and desired project aesthetics.

B. Exclusions: In addition to material obviously not requiring paint such as stainless steel, plastic laminate, glass, flooring, tile, etc. Do not paint or finish:

1. Surfaces indicated by finish schedule to remain unfinished.

2. Factory finished surfaces indicated to be factory finished.

   a. Aluminum with anodized or baked-on finish.

   b. Finish hardware, except hardware with USP finish.

   c. Electrical devices, fixtures, and trim.

3. Equipment such as mechanical and electrical equipment located inside equipment rooms.

1.2 REFERENCES

A. NPCA (National Paint and Coatings Association) - Guide to U.S. Government Paint Specifications.

B. PDCA (Painting and Decorating Contractors of America) - Painting - Architectural Specifications Manual.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Indoor Air Quality: Provide products which will not adversely affect indoor air quality through emission of toxic gasses or vapors. If possible, do not use materials with residual of formaldehyde, epoxy resin, or urea-based materials.

B. Existing oil base surfaces that are to be painted with latex paint shall first be primed with a primer recommended by paint manufacturer to ensure 100 percent bonding of the new paint.

C. Where existing areas with lead-based paints are disturbed, air borne particle, water shall be avoided. Paint containing lead shall be wet scraped (No sanding) and shall comply with COMAR 09.12.32 and 26.02.07 Occupational Exposure to Lead in Construction publications, as administered by Maryland Occupational Safety and Health (MOSH) Public Sector and OSHA.

D. In renovation projects, proper procedures per paint manufacturer’s recommendations shall be exercised to ensure 100 percent bonding of paint to surfaces that have weathered a season or more without heat or in adverse environmental conditions.

1.4 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data: Provide data on all finishing products and special coatings.

C. Samples: Submit two samples, 6 x 6 inch in size illustrating selected colors and textures for each color selected.

D. Manufacturer's Instructions: Indicate special surface preparation procedures, and substrate conditions requiring special attention.

E. Verify in writing that the products specified will be used as directed or submit for approval a list of comparable materials of another listed approved manufacturer, including full identification of all products by name, color, and catalogue number adjacent to those specified, with a statement of equality by the proposed manufacturer.

F. Submit Manufacturer’s certification (MSDS Sheet) for each paint and coating.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five (5) years’ experience.

B. Applicator: Company specializing in performing the work of this section with minimum five (5) years’ experience and approved by manufacturer.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke rating requirements for finishes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, VOC content, and instructions for mixing and reducing.

C. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions. Storage space shall be designated by the Contractor and approved by the Architect.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 degrees C) for interiors; 50 degrees F (10 degrees C) for exterior, unless required otherwise by manufacturer's instructions.

1.9 EXTRA MATERIALS

A. Provide 1 gallon of each color and surface texture used in the facility to the Owner at the completion of the project.

B. Contractor shall label each container with color, type, texture, and room locations in addition to the manufacturer's label.

1.10 MAINTENANCE

A. Provide under the provisions of Division 1.

B. Provide maintenance data including information regarding cleaning instructions.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Best quality materials as manufactured by one of following manufacturers will be acceptable:

1. For Brush, Roller (no spraying is permitted):

a. Sherwin Williams (basis-of-design, unless otherwise noted)

b. Duron

c. McCormick

d. Benjamin Moore

B. Quality: All products not specified by name shall be "best grade" or "first line" products of acceptable manufacturers. See Part 3 - Execution for materials required for this project. Where possible, provide materials of single manufacturer.

2.2 MATERIALS

A. Coatings: Ready mixed. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.

B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.3 FINISHES

A. See finish drawings for quantity of colors and accent paint locations.

1. Interior Surfaces:

a. Interior Wall Paint (CMU):

1) 2 coats latex block filler – S-W PreRite Block Filler, B25W25

2) 2 coats interior latex semi-gloss – S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31 Series

b. Interior Wall Paint (Gypsum Board):

1) 1 coat primer – S-W ProMar 200 Zero VOC Interior Latex Primer, B28 Series

2) 2 coats interior latex eg-shel – S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20 Series

c. Interior Ceiling Paint (Gypsum Board):

1) 1 coat primer – S-W ProMar 200 Zero VOC Interior Latex Primer, B28 Series

2) 2 coats interior latex flat – S-W ProMar Ceiling Paint Flat, A27 Series

d. Interior Paint (Ferrous Metal):

1) 1 coat primer - Pro Industrial Pro-Cryl Universal Acrylic Primer Off White

2) 2 coats semi-gloss epoxy - Pro Industrial PreCatalyzed Waterbased Semi-Gloss Epoxy, K46 Series

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that substrate conditions are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application to the Architect and General Contractor.

C. Test shop applied primer for compatibility with subsequent cover materials.

D. Allow masonry work to cure for at least 30 days before coating. Gypsum board shall be allowed to dry for 15 days before coating.

3.2 PREPARATION

A. Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

B. Correct defects and clean surfaces which affect work of this section. Remove existing coatings that exhibit loose surface defects.

C. Seal with shellac and seal marks which may bleed through surface finishes.

D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

F. Galvanized Surfaces: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

G. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

H. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

I. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime metal items including shop primed items.

J. Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

K. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried, sand between coats.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Painting shall be in accordance with industry standards in reference to preparation of surfaces, environmental conditions, and applications.

C. Scheduling of painting shall be coordinated to precede installation of finished materials such as flooring, casework, etc. Any finished material installed prior to painting shall be properly protected.

D. Do not apply finishes to surfaces that are not dry.

E. Apply each coat to uniform finish to eliminate possibility of laps, skips and brush marks.

F. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

G. Sand surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

I. Allow applied coat to dry before next coat is applied.

J. Prime concealed surfaces of interior woodwork with primer paint.

K. Full wall shall be painted where paint is scheduled, including but not limited to portions of wall concealed by casework.

L. Finished work is to be adequately covered with uniform color and finish. The number of coats herein specified being a minimum, this contract shall provide any additional coats to produce a first-class job. Architect may select accent colors or deeptone colors (contrasting bright colors) for interior painted walls or ceilings. Where bright colors are selected, apply extra coats of paint where required to obtain completely opaque surface. Make allowances for 10 percent deep tones in bid. Additional labor or materials used for this purpose not allowable as extra cost.

M. Allow the following minimum drying time between coats:

1. Interior work-24 hours.

3.4 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Mechanical, Plumbing, and Electrical specifications for schedule of color coding and identification banding of equipment, duct work, piping, and conduit.

B. Paint shop primed equipment.

C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

D. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

E. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

F. Paint exposed conduit and electrical equipment occurring in finished areas.

G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

H. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated. Color band and identify with flow arrows, names, and numbering.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.5 PROTECTION AND CLEANING

A. Protection: Protect floors and adjacent surfaces from paint smears, spatters, and droppings.

1. Cover fixtures not to be painted. Mask off areas as required.

2. Finish Hardware: Ensure hardware is removed prior to starting painting operations and that it is replaced only after painting operations have been completed.

a. Hardware Removal and Replacement: Section 08 71 00.

B. Damage to Other Work: Be responsible for damage done to adjacent work. Repair damaged work to satisfaction of Architect. Replace materials damaged to extent that they cannot be restored to their original condition.

C. Cleaning: Daily clean-up of empty cans, rags, rubbish, and other discarded paint materials shall be removed from site by Contractor, in accordance with Federal, State and Local regulations.

D. Upon completion, clean glass and paint spattered surfaces.

- END OF SECTION 09 90 00 -

SECTION 14 42 00
VERTICAL PLATFORM LIFTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Commercial hydraulic vertical platform wheelchair lifts.

1.2 RELATED SECTIONS

A. Division 26 Sections for electrical service for lifts to and including disconnect and fused switches at machine room.

1.3 REFERENCES

A. American National Standards Institute (ANSI) B-29.2 - Chain Standards for Inverted Tooth (Silent) Chains and Sprockets.

B. American Society of Mechanical Engineers (ASME) A18.1 - Safety Standard for Platform and Stairway Chair Lifts.

C. U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)".

D. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.

E. NFPA 70 - National Electric Code.

1.4 REQUIREMENTS OF REGULATORY AGENCIES:

A. Fabricate and install work in compliance with applicable jurisdictional authorities.

B. File shop drawings and submissions with local authorities as the information is made available. Company pre-inspection and jurisdictional authority inspections and permits are to be made on timely basis as required.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Construction details, material descriptions, dimensions of individual components, and finishes for lifts.
   2. Rated capacities, operating characteristics, electrical characteristics, safety features, controls, finishes, and accessories.
   3. Preparation instructions and recommendations.
   4. Storage and handling requirements and recommendations.
   5. Installation methods.

C. Shop Drawings: Provide a complete layout of lift equipment detailing dimensions and clearances as required.
   1. Include plans, elevations, sections, details, attachments to other work, and required clearances.

2. Indicate dimensions, weights, loads, and points of load to building structure.
3. Include details of equipment assemblies, method of field assembly, components, and location and size of each field connection.
4. Include diagrams for power, signal, and control wiring.

D. Selection Samples: For each finish product specified requiring selection of color or finish, two complete sets of color charts representing manufacturer's full range of available colors and patterns.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.
B. Product Certificates: For each type of lift. Include statement that runway, ramp or pit, dimensions as shown on Drawings, and electrical service as shown and specified are adequate for lift being provided.
C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lift to include in operation and maintenance manuals.
   1. In addition to items specified in Section 01 78 20 "Operation and Maintenance Data," include the following:
      a. Parts list with sources indicated.
      b. Recommended parts inventory list.
B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted use of lifts.
C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard two-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Skilled tradesmen shall be employees of the installing contractor approved by the manufacturer, with demonstrated ability to perform the work on a timely basis.
   2. Execute work of this section only by a company that has adequate product liability insurance.
   3. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.10 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install systems

under environmental conditions outside manufacturer's absolute limits.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of lifts that fail in materials or workmanship within specified warranty period.

1. Special Warranty Period: Two years from date of Substantial Completion.

2. The manufacturer shall offer a 36-month limited warranty on parts from date of shipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Savaria

1. Premier Lifts, a division of Savaria USA; Vince Russo, 410-561-7006 x 209, vince.russo@premierlifts.com

B. Additional Acceptable Manufacturers:

1. Ascension, Clarity

2. Bruno

C. Substitutions: Not permitted.

2.2 COMMERCIAL WHEELCHAIR LIFT

A. Hydraulic Vertical Platform Lifts: Savaria:
1. Model: Multilift, model Vertical Platform Lift

B. Hydraulic Vertical Platform Lift: The lift described here, manufactured by Savaria UDA Inc, is a vertical platform lift consisting of a hydraulic tower with a lifting platform. The platform is made to accommodate a wheelchair user or a person with impaired mobility. The lift can be used indoors in commercial applications.

C. Work described in this section includes providing equipment, incidental material and labor required for complete, operable roped hydraulic wheelchair lift installation. Lifts shall be erected, installed, adjusted, tested and placed in operation by lift system manufacturer, or manufacturer's authorized installer.
1. Lifts shall be in accordance:
   a. ASME A18.1
   b. ASME A17.5
   c. ADAAG
   d. ANSI A117.1
   e. NFPA 70 (NEC)

D. The following preparatory work to receive the lifts specified in this section is part of the work of other sections:
1. Permanent 120 VAC, 20-amp single phase power to operate lift to be provided from a lockable fused/cartridge type disconnect switch with auxiliary contacts for battery operation. Refer to drawings for permanent power specifications and location of disconnects. Temporary power may be provided

to expedite installation of lift.
2. Provide rough openings per lift contractor's shop drawings.
3. Provide substantial, level floor slab as indicated on the lift contractor's shop drawings.

E. Characteristics:
1. Rated Load: 750 lb (340 kg).
2. Rated Speed: 8 fpm (0.04 m/s).
3. Car Dimensions:
   a. Platform Clear space: 36” x 54”
   b. Levels Serviced: 2.
4. Car Configuration:
   a. Front/rear exit.
5. Travel: 34” to 168” Allowable
   a. Verify existing conditions in the field, approximately 37”
6. Pit Depth:
   a. 0”
7. Installation Environment
   a. Indoor (interior install)
8. Powder Coat Finish
   a. Almond beige
9. Operation: Three (3) Constant pressure operating switches, two (2) for remote mounting outside of the platform and one (1) located inside the platform.
   a. Provide a separate “PUSH TO STOP” emergency button on the passenger control station.
10. Power Supply: 24-volt, 15 amp, 1 phase, 60 Hz.
11. Drive System: 2:1 chain hydraulic.
12. Emergency Power:
   a. Full-time battery power supplied by 24VDC SLA battery bank.
13. Controller: Relay logic-based controller.
14. Motor: 1HP, 24 volts
15. Manual Lowering: Outside the hoistway at lower landing with keyed box.

F. Car Enclosure: Side Guards of platform shall have a steel frame with a powder coat finish and panel inserts to a minimum of 42 inches high. Car floor to have anti-skid painted finish in manufacturer’s standard color.

G. Doors and Gates:
1. First landing door:
   a. Door type: Platform Gate
   b. Flush closing operation with enclosure side.
   c. Operation
      1) Self-closing.
      2) Automatic - Surface 24-volt door opener with battery back-up for low profile aluminum door.
   d. Door Width
      1) 36 inches (889 mm)
2. Upper landing door/gate:
   a. Door/gate type:
      1) 42” high low profile aluminum gate with a concealed electro/mechanical interlock.
   b. Flush closing operation with enclosure side.
   c. Operation
      1) Self-closing.
      2) Automatic – Surface mounted gate opener for low profile

aluminum gate.

d. Door/Gate Width

1) 36 inches (889 mm)

H. Lift Enclosure:

1. The enclosure will be made entirely of aluminum for durability against corrosion.
2. The enclosure frames and panels shall be fully assembled and screwed together from inside the enclosure for ease of assembling and quick installation time.
3. All enclosure inserts shall be replaceable from the inside of the enclosure for ease of service.
4. Provide closure panels to match lift enclosure material and finish to close off gaps between lift system and hoistway surfaces.

I. Call Stations: Provide flush, surface or door frame mounted landing call/send stations.

1. Call stations will be:
   a. Keyed (removable in off position)

J. Car Operation:

1. Car Operating Panel shall consist of constant pressure buttons, emergency stop/alarm button, and emergency LED light mounted on a removable stainless-steel panel (Type 304 #4 Stainless Steel Finish).

K. Pumping Unit and Control:

1. The pumping unit and control shall be enclosed in the tower. The controller and pump unit shall be pre-wired and tested prior to shipment. The controller is to be relay logic-based operation for ease of maintenance and service. Pump unit shall incorporate the following features:
   a. Adjustable pressure relief valve.

b. Manually operable down valve to lower lift in the event of an emergency. This valve shall be activated from outside of the hoistway through a keyed box.

2. Pressure gauge isolating valve, manually operable.

3.Gate valve to isolate cylinder from pump unit.

4. Electrical solenoid for down direction control.

5. Emergency Operation - A manual lowering device shall be located outside the hoistway in a lockable box positioned at a lower landing.

L. Cylinder and Plunger:

1. The cylinder shall be constructed of steel pipe of sufficient thickness and suitable safety margin. The top of the cylinder shall be equipped with a cylinder head with an internal guide ring and self-adjusting packing.
2. The plunger shall be constructed of a steel shaft of proper diameter machined true and smooth. The plunger shall be provided with a stop electrically welded to the bottom to prevent the plunger from leaving the cylinder.

M. Roller Chains: Two No.50 roller chains with 5/8-inch (16 mm) pitch. Minimum breaking strength 6100 lb (2773 kg) each.

N. Leveling Device:

1. The lift shall be provided with an anti-creep device which will maintain the carriage level within 1/2 inch (12 mm) of each landing.
2. All limit switch and leveling device switches shall be located in a position to be inaccessible to unauthorized persons. They shall be located behind the mast wall and be accessible through removable panels.

O. Guide Yoke: The 2:1 guide yoke/sprocket assembly shall be supplied with idler sheaves, roller guide shoes, bearings, and guards.

P. Terminal Stopping Devices: Normal terminal stopping devices shall be provided at top and bottom of runway to stop the car positively and automatically.

Q. Guide Rails and Brackets: Steel “C" guide rails and brackets shall be used to guide the platform and sling. Guide rails shall form part of the structural integrity of the unit and be integral to the mast enclosure, ensuring stability and minimum platform deflection when loaded.

R. Car Sling: Car sling shall be fabricated from steel tubing 44 inches (1116 mm) high with adequate bracing to support the platform and car enclosure. Roller guide shoes shall be mounted on the top and bottom of the car sling to engage the guide rails. Guide shoes shall be roller type with 3 inches (76 mm) diameter wheels. Nylon guide shoes shall not be used for better ride quality and durability.

S. Wiring: All wiring and electrical connections shall comply with applicable codes. Insulated wiring shall have flame-retardant and moisture-proof outer covering and shall be run in conduit or electrical wire ways if located outside the unit enclosure. Quick disconnect harnesses shall be used when possible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until hoistway has been properly prepared. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance of the Work.

B. Site dimensions shall be taken to verify that tolerances and clearances have been maintained and meet local regulations. Verify that installed lift will have a minimum headroom of 80 inches (2032 mm) above any point on platform floor at any point of travel.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 LIFT INSTALLATION

A. General: Comply with ASME A18.1 and manufacturer's written instructions for installation of lifts unless otherwise indicated. Install all the components of the lift system that are specified in this section to be provided, and that are required by jurisdictional authorities to license the lift.

B. Trained employees of the lift contractor shall perform all installation work of this section.

C. Wiring Method: Conceal conductors and cables within housings of units or building construction. Do not install conduit exposed to view in finished spaces. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

D. Adjust lift for proper operation and clean unit thoroughly.

E. Coordinate runway doors with platform travel and positioning, for accurate alignment and minimum clearance between platforms, runway doors, sills, and door frames.

F. Position sills accurately and fill space under sills solidly with nonshrink, nonmetallic grout.

G. Coordinate platform doors with platform travel and positioning.

H. Adjust stops for accurate stopping and leveling at each landing, within required tolerances.

1. Leveling Tolerance: 1/4 inch (6 mm) up or down, regardless of load and direction of travel.

I. Lubricate operating parts of lift, including drive mechanism, guide rails, hinges, safety devices, and hardware.

J. Test safety devices and verify smoothness of required protective enclosures and other surfaces.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of lift installation and before permitting use of lifts, perform acceptance tests as required and recommended by ASME A18.1 and authorities having jurisdiction.

B. Operating Test: In addition to acceptance testing, load lifts to rated capacity and operate continuously for 30 minutes between lowest and highest landings served. Readjust stops, signal equipment, and other devices for accurate stopping and operation of system.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on lifts.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 24 months' full maintenance by skilled employees of lift Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper lift operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Perform emergency callback service during normal working hours with response time of two hours or less.
3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

B. Maintenance contract is to be executed independently from modernization contract. Within the elevator modernization bid, include a line item for maintenance costs. Maintenance contract will be executed based off cost submitted within Modernization bid.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lifts. Include a review of emergency systems and emergency procedures to be followed at time of operational failure and other building emergencies.
B. Check operation of lifts with Owner's personnel present and before date of Substantial Completion. Determine that operating systems and devices are functioning properly.
C. Check operation of lifts with Owner's personnel present not more than one month before end of warranty period. Determine that operating systems and devices are functioning properly.

3.7 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

- END OF SECTION 14 42 00 -

SECTION 26 05 01
GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL

A. Provide all labor, materials, equipment and services necessary for and incidental to the complete installation and operation of all electrical work.

B. All work under this Division is subject to the General Conditions and Special Requirements for the entire contract.

C. Unless otherwise specified, all shop drawings and submissions required under Division 26 shall be made to, and acceptances and approvals made by, the ENGINEER.

D. Conform to the requirements of all rules, regulations, and codes of local, state, and federal authorities having jurisdiction. Conform to the National Electrical Code and all NECA – National Electrical Installation Standards (NEIS).

E. Perform the work in a first-class, substantial, and workmanlike manner. Any materials installed which do not present an orderly and neat workmanlike appearance shall be removed and replaced when so directed by the Engineer, at the Contractor's expense.

F. Coordinate the work of all trades.

G. Arrange conduit, wiring, equipment, and other work generally as shown, providing proper clearances and access. Carefully examine all contract drawings and fit the work in each location without substantial alteration. Where departures are proposed because of field conditions or other causes, prepare and submit detailed drawings for approval in accordance with “Submittals” specified below. The right is reserved to make reasonable changes in location of equipment, conduit, and wiring up to the time of rough-in or fabrication.

H. The contract drawings are generally diagrammatic and all offsets, bends, fittings, and accessories are not necessarily shown. Provide all such items as may be required to fit the work to the conditions.

I. Be responsible for all construction means, methods, techniques, procedures, and phasing sequences used in the work. Furnish all tools, equipment and materials necessary to properly perform the work in a first class, substantial, and workmanlike manner, in accordance with the full intent and meaning of the Contract Documents.

J. The Contractor shall provide other work and services not otherwise included in the Contract Documents that are customarily forwarded in accordance with generally-accepted construction practices.

1.2 PERMITS, INSPECTIONS, AND FEES:

1. The Contractor shall obtain and pay for all charges and fees, and deliver all permits, licenses, certificates of inspection, etc., required by the authorities having jurisdiction. Deliver inspection, approval, and other certificates to the Owner prior to final acceptance of the work.

B. File necessary plans, prepare documents, give proper notices, and obtain necessary approvals.

C. Permits and fees shall comply with the General Requirements of the Specification.

D. The Owner will pay for the building permit.

E. Notify Inspection Authorities to schedule inspections of work. All work shall be subject to field inspections.

F. Notify Architect in advance of scheduled inspections.

G. An electrical foreman, superintendent or other supervisor shall be in attendance for all scheduled inspections.

H. The Contractor shall provide an electrical certificate from an independent electrical inspection agency approved by the Owner and the State Fire Marshal. The Contractor shall submit certificate prior to final payment invoice. The Contractor shall pay all fees, including filing fees.

1.3 ELECTRICAL WORK UNDER OTHER DIVISIONS:

A. Architectural Equipment: In general, any electrically operated or controlled equipment furnished under architectural divisions shall be supplied with control wiring, transformers, contacts, etc. Contractor shall provide power circuits to such equipment and install all electrical control equipment related thereto.

B. Carefully review the contract documents and coordinate the electrical work under the various Divisions.

1.4 CONTRACTOR QUALIFICATION:

A. Any Contractor performing work under this Division shall be fully qualified and acceptable to the Engineer. Submit the following evidence for approval:

1. A list of not less than five (5) comparable projects that the Contractor completed.

2. Letters of reference from not less than three (3) registered professional engineers, contractors, or building owners, explaining Contractor proficiency, quality of work, or other attribute on projects of similar size or substance.

3. Local or State license.

4. Membership in trade or professional organization where required.

5. Copy of Master Electrician’s License.

B. Contractor is any individual, partnership, corporation, or firm performing work by Contract or subcontract on this project.

C. Acceptance of a subcontractor will not relieve the Contractor of any contractual requirements or his responsibility to supervise and coordinate the various trades.

D. Supervisory Qualifications: The electrical work on the project shall be under the direct supervision of a licensed Master Electrician.

E. Qualifications of Installers:

1. For the actual fabrication, installation, and testing of the work, the Contractor shall use only thoroughly trained and experienced personnel who are completely familiar with the requirements of this work and with the installation recommendations of the manufacturers of the specified items.
2. The Electrical Installer shall utilize a full time project foreman in charge of all electrical work. This person shall be fully qualified and experienced in such work and shall be available, on site, at all times during Construction. All problems, questions, coordination, etc., relating to electrical work shall take place through this person to the Architect.

1.5 FIRE SAFE MATERIALS:

A. Unless otherwise indicated, materials and equipment shall conform to UL, NFPA, or ASTM Standards for Fire Safety with Smoke and Fire Hazard Rating not exceeding flame spread of 25 and smoke developed of 50.

1.6 REFERENCED STANDARDS, CODES, ORDINANCES AND SPECIFICATIONS

A. Specifications, Codes and Standards listed below are included as part of this specification, latest edition.

ADA	Americans with Disabilities Act
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
IBC	International Building Code
CABO	Council of American Building Officials
FM	Factory Mutual
IEEE	Institute of Electrical and Electronics Engineers
MOSHA	Maryland Occupational Safety & Health Administration
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
OSHA	Occupational Safety & Health Administration
UL	Underwriters Laboratories

B. All electrical equipment and materials shall comply with the Codes and Standards listed in the latest edition of IEEE Standard 241, *Electric Power Systems in Commercial Buildings*, Chapter 1, Section 1.6, entitled “Codes and Standards”.

C. Comply with all Codes applicable to the work:
   1. Bidders shall inform themselves of all local and state codes and regulations.
   2. In case of conflict between Contract Documents and governing Codes, the most stringent shall take precedence. Where, in any specific case, different sections of any applicable codes or when Drawings and Specifications specify different materials, methods of Construction, or other requirements, the most restrictive shall govern.
   3. Where Contract Documents exceed minimum Code requirements, and are permitted under the Code, the Contract Documents take precedence and shall govern.
   4. No extra payment will be allowed for work or changes required by local Code enforcement authorities.

D. Underwriters Laboratories Labels shall apply to all materials and devices, etc., except specified items not covered by existing UL Standards.

E. Conflicts with applicable regulations:
   1. Resolve at Contractor’s expense.
   2. Prepare and submit details of alternate construction:
      a. Acceptable solution of conflict.
      b. List of substitute materials:

   For approval of inspecting authorities.
   For approval of Engineer.

F. Comply with all NECA’s National Electrical Installation Standards (NEIS), including NECA 1-2000 “Standard Practices for Good Workmanship in Electrical Contracting”.

1.7 INTERPRETATION OF DOCUMENTS

A. Any discrepancies between Drawings, Specifications, Drawings and Specifications, or within Drawing and Specifications shall be promptly brought to the attention of the Owner during the bidding period. No allowance shall subsequently be made to the Contractor by reason of his failure to have brought said discrepancies to the attention of the Owner during the bidding period or of any error on the Contractor’s part.

B. The locations of products shown on Drawings are approximate. The Contractor shall place the devices to eliminate all interference with above-ceiling ducts, piping, etc. Where any doubt exists, the exact location shall be determined by the Owner and Architect.

C. All general trades and existing conditions shall be checked before installing any outlets, power wiring, etc.

D. Equipment sizes shown on the Drawings are estimated. Before installing any wire or conduit, the Contractor shall obtain the exact equipment requirements and install wire, conduit, or other item of the correct size for the equipment actually installed. However, wire and conduit sizes shown on the Drawings shall be taken as a minimum and shall not be reduced without written approval from the Architect/Engineer.

E. Where variances occur between the drawings and specifications or within either document itself, the item or arrangement of better quality, greater quality, or higher cost shall be included in the Contract Price. The Engineer will decide on the item and manner in which the work shall be installed.

F. Contract Drawings are generally diagrammatic and all offsets, fittings, transitions, and accessories are not necessarily shown. Furnish and install all such items as may be required to fit the work to the conditions encountered. Arrange conduits, equipment, and other work generally as shown on the Contract Drawings, providing proper clearance and access. Where departures are proposed because of field conditions or other causes, prepare and submit detailed Shop Drawings for approval in accordance with “submittals” specified below. The right is reserved to make reasonable changes in location of equipment, piping, and ductwork, up to the time of rough-in or fabrication.

G. Work not specifically outlined, but reasonably incidental to the completion of the work, shall be included without additional compensation from the Owner.

1.8 CUTTING AND PATCHING

A. The cutting of walls, floors, partitions, etc., for the passage and/or accommodation of conduits, etc., the closing of superfluous openings and the removal of all debris caused by said work under this contract shall be performed by and at the expense of the Electrical Contractor.

B. No cutting of any structure or finishes shall be done until the condition requiring such cutting has been examined and approved by the Architect.

C. All surfaces disturbed as a result of such cutting shall be restored under this division to match original work and all materials used for any patching, mending or finishing must conform to the class of materials originally installed.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Material and equipment installed as a part of the permanent installation shall be new, unless otherwise indicated or specified, and shall be approved by the Underwriters' Laboratories, Inc., for installation in each particular case where standards have been established.

B. Where material or equipment is identified by proprietary name, model number, and/or manufacturer, furnish the named item or equivalent thereof, subject to acceptance.

C. Material submissions shall conform to requirements outlined in SUBMITTALS, REVIEW, AND ACCEPTANCE.

D. The suitability of named item only has been verified. Where more than one Manufacturer is named, only the first named Manufacturer has been verified as suitable alternate. Manufacturers and items other than the first named shall be equal or better in quality and performance to that of specified items, and must be suitable for available space, required arrangement, and application. Submit all data necessary to determine suitability of alternate manufacturers for review. Provide a list company proposed and specified products and performance on the first page of the submittal. Failure to clearly identify differences will result in the submittal being returned as “Revise and Resubmit”. The Contractor, by providing other than the first named Manufacturer, assumes responsibility for all necessary adjustments and modifications necessary for a satisfactory installation.

E. The Contractor shall only submit those manufacturers indicated in the Specification. Proposed manufacturers other than those indicated will not be considered unless the specific item indicates “or as approved equal”. Submit all data necessary to determine suitability of substituted items for approval. Failure to do so will result in a “Revise and Resubmit” response.

F. All items of equipment furnished shall have a service record of at least five (5) years.

2.2 SUBSTITUTIONS

A. Substituted items or items other than those named shall be equal or better in quality and performance and must be suitable for the available space, required arrangement, and application. Submit any and all data necessary to determine the suitability of substituted items. The Contractor shall be responsible for correct application, placement, and installation of substituted equipment. Cost savings data shall also be submitted with submittal data for substituted items. Total cost savings or a per-unit saving to the Owner shall be clearly indicated. If a substituted item is accepted, all cost savings shall be returned to the Owner as a credit.

B. Substitutions will not be permitted for specific items of material or equipment where specifically indicated.

C. For substituted items, clearly list on the first page of the submittal all differences (i.e. paragraph-by-paragraph, performance differences, physical differences, etc.) between the specified item and the proposed item. The Contractor shall be responsible for corrective action (or replacement with the specified item) while maintaining the specification requirements if differences have not been clearly indicated in the submittal.

D. Where the Contractor proposes to use an item of equipment or application other than that specified or detailed on the Drawings, which requires any redesign of the structure, partitions, foundation, HVAC, piping, wiring, or any other part of the mechanical, electrical, or architectural layout, all such redesign and all new drawings and detailing required thereafter shall be prepared by the Contractor at his own expense for review by the Owner representative, Architect and Engineer before any such work is implemented.

E. All Contractor-proposed changes and revisions shall be at the Contractor’s risk and expense. The Contractor shall fully coordinate all revisions, substitutions and changes with other trades. The Contractor shall provide all necessary provisions, including HVAC, ventilation, foundations, access, etc., for a complete, code compliant, and fully functional installation.

F. Where the Contractor elects to submit a substitution for equipment or materials, he shall:

1. Submit Shop Drawings that show complete compliance to each statement or requirement of the Specifications.
2. Submit certified test data from an independent testing laboratory for each product.
3. Submit one complete working sample of the equipment or materials to be furnished. In cases involving large or heavy items of equipment, the Owner may waive the requirement to submit the sample.

G. Failure to comply with the above-required submissions shall constitute an automatic rejection of the substitution.

2.3 SUBMITTALS, REVIEW, AND ACCEPTANCE

A. General:

1. The equipment, material, installation, workmanship, arrangement of work, final instruction, and final documentation is subject to review and acceptance. No substitution will be permitted after acceptance of equipment or materials except where such substitution is considered by the Engineer to be in the best interest of the Owner. Submit for review in clear and legible form the following documents:

2. Identify all submittals, indicating the intended application, location, or service of the submitted item. Refer to specification sections or paragraphs where applicable. Clearly indicate the exact type, model number, size, and special features of the proposed item. Clearly list on the first page of the Submittal all differences between the specified item and the proposed item. The Contractor shall be responsible for corrective action (or replacement with the specified item) while maintaining the specification requirements, if differences have not been clearly indicated in the submittal. Submittals of a general nature will not be acceptable.

3. Submit actual operating conditions or characteristics for all equipment where required capacities are indicated. Factory order forms showing only required capacities will not be acceptable. Indicate all options used to meet the specifications. It is not the responsibility of the Engineer or Owner to make selections of factory options other than colors. Submittals lacking proper selection of factory options or special features required by the specification shall be RETURNED WITHOUT REVIEW.

4. Acceptance will not constitute waiver of contract requirements unless deviations are specifically indicated and clearly noted.

5. Documents of general form indicating options shall be clearly marked to show what is specifically proposed for this project.

6. Submittals NOT IN COMPLIANCE with the requirements of this section will be RETURNED WITHOUT REVIEW.

B. Material, Equipment, Manufacturer and Subcontractor List: Within 30 calendar days after the award of contract, submit a complete MATERIAL, EQUIPMENT, MANUFACTURER AND SUBCONTRACTOR LIST for preliminary review. List all proposed materials and equipment, the associated proposed Manufacturer, and any proposed subcontractors. After the receipt of reviewed Material and Equipment List, submit complete Shop Drawings for approval. List all materials and equipment, indicating manufacturer, type, class, model, curves, and other general identifying information. Submittals shall be specific for each building as contained in the individual building Specifications and Drawings.

C. Shop Drawings shall be submitted and approved for all materials and equipment prior to installation. If any material and/or equipment is installed prior to receipt by the Contractor of approved Shop Drawings, the Contractor is liable for its replacement at no additional cost to the Owner.

D. Data submitted shall include information on all materials and equipment to demonstrate compliance with the Contract Drawings and Specifications. Where installation procedures or any part thereof are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendations shall be cause for rejection of the equipment or material.

E. Any deviation of submitted material or equipment from the Contract Drawings or Specifications shall be clearly marked in red ink on Submittals, and itemized in a transmittal letter, in order to receive consideration for approval.

F. Approval of material or equipment submittals containing deviations not specifically identified by Contractor shall not relieve the Contractor from compliance with specified requirements.

G. Thoroughly review and stamp all submittals to indicate compliance with Contract requirements prior to submission. Coordinate installation requirements and any electrical requirements for equipment submitted. Contractor shall be responsible for correctness of all submittals.

H. Submittals will be reviewed for general compliance with design concept in accordance with Contract Documents, but dimensions, quantities, or other details will not be verified.

I. Increase, by the quantity listed below, the number of electrical related Shop Drawings, product data, and samples submitted, to allow for required distribution plus two copies of each submittal required, which will be retained by the Electrical Consulting Engineer.

1. Shop Drawings - Initial Submittal: 1 additional blue- or black-line print.
2. Shop Drawings - Final Submittal: 1 additional blue- or black-line print.
3. Product Data: 1 additional copy of each item.

N. Additional copies may be required by individual sections of these Specifications.

O. Shop Drawings (include but not limited to):

1. Prepare and submit SHOP DRAWINGS AND/OR DIAGRAMS for all specially fabricated items, modifications to standard items, specially designed systems where detailed design is not shown on the contract drawings, or where the proposed installation differs from that shown on the contract drawings.

P. The Contractor, additionally, shall submit for approval any other shop drawings as required by the Architect. No item listed above shall be delivered to the site, or installed, until approved. After the proposed materials have been approved, no substitution will be permitted except where approved by the Engineer.

Q. The Contractor shall prepare and submit a Detail Schedule of Values indicating the Contract costs for the major work items. The Contractor shall provide additional detail and information as requested by the Engineer.

2.5 RECORD DRAWINGS:

A. As the work progresses, record on a set of white prints the installed locations, sizes of electric feeders, equipment, etc. Upon completion of the work, submit one (1) complete set of white prints with "As-Built" information neatly recorded thereon in red ink. Use other colors to distinguish between variations in separate categories of the work. Note related change-order numbers where applicable. Provide electronic copies to the owner and architect at the completion of the project.

B. Prepare a list of the manufacturers of all major equipment, their local service representative and procedures for obtaining service.

C. Post one (1) copy of all instructions, lists, charts, and diagrams at the equipment or where indicated, mounted under glass or approved plastic cover.

D. Furnish to the Owner two (2) copies of the Manufacturer's installation and operations instructions, and an electronic copy. Include replacement parts lists where applicable. Also include copies of all posted instructions, lists and charts. Assemble the material in one or more heavy duty 8- 1/2"

x 11" loose leaf binders with tab separators. Submit for approval before final delivery. Binder shall be labeled on spine and on cover with Project Name.

E. Deliver all instruction materials to the Owner prior to the formal instruction period.

F. Deliver two (2) complete sets of all approved submittals to the Owner for filing, including electronic copies.

G. Prepare record documents in accordance with the requirements in the specifications. In addition to the requirements specified, indicate installed conditions for:

1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and circuit breaker size and arrangements.
2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
3. Approved Substitutions, Contract Modifications, and actual equipment and materials installed.

I. The Contractor shall keep at the site at all times during construction, one set of up-to-date Contract prints for the express purpose of showing any and all changes made during construction. The Contractor shall make the prints showing each change and shall incorporate all changes in “Record/As-Built Drawings” to be submitted to the Engineer upon completion of the project.

J. The Contractor shall show proof of up-to-date record drawings to the Owner prior to submitting monthly invoice.

K. The Contractor shall conform to all drawings, including all revisions, addendums, alternates, change orders, deletions, existing conditions, and as-built conditions without extra cost to the Owner.

2.6 **EXECUTION**

3.1 EXAMINATION OF SITE, SURVEYS, AND MEASUREMENTS:

A. Examine the site, determine all conditions and circumstances under which the work must be performed, and make all necessary allowances for same. No additional cost to the Owner shall be permitted for Contractor’s failure to do so.

B. Examine the site and observe the conditions under which the work will be done or other circumstances which will affect the contemplated work. No allowance will be made subsequently in this connection for any error or negligence on the Contractor's part.

C. The Contractor shall base all measurements, both horizontal and vertical, from established benchmarks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.

D. Any discovery of discrepancy between actual measurements and those indicated which prevents following good practice or the intent of the Drawings and Specifications shall be brought to the attention of the Owner’s Representative. Work shall not proceed until receiving instructions from the Owner’s Representative.

E. The Contractor shall follow Drawings in laying out the work and check Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, the Owner's Representative shall be notified before proceeding with the installation.

F. To prevent conflict with the work of other trades and for proper execution of the work, the Contractor, as directed by the Architect/Engineer, shall make the necessary modifications in the layout as needed, at no extra charge to the Owner.

G. The Contractor shall be solely responsible for the proper arrangement of his conduit and equipment.

H. The Engineer shall make all final decisions as to any conditions that require the changing of any work.

I. The Contractor shall have competent supervision on the site at all times to lay out, check, coordinate, and supervise the installation of all electrical work and be responsible for the accuracy thereof. He shall plan the installation of all electrical work, giving consideration to the work of other trades, to prevent interference.

J. The Contractor shall determine the location, size, etc., of all chases, sleeve openings, etc., required for the proper installation of the electrical work and see that such are provided. All chases, sleeves, openings, etc., shall be set prior to erection of new work to prevent delay in the progress of other work or trades.

K. Conditions and/or situations that prevent the proper installation of any equipment or item where shown on the Drawings shall be called to the attention of the Engineer for instructions.

L. The Contractor shall have equipment shipped or fabricated in sections of suitable size for entering the building and being removed from the finished building in the future, if necessary.

M. The Contractor shall fully investigate all peculiarities and space limitations for all materials and equipment.

N. Outlet, pull, and junction boxes and other appliances that require operation, examination, adjustment, servicing or maintenance shall be readily accessible.

O. The Contractor shall take all field measurements necessary for this work and shall assume responsibility for their accuracy.

P. The Contractor shall coordinate the electrical work with all other sub-contractors. All work shall be so arranged that there will be no delay in the proper installation and completion of any part or parts of electrical equipment. All electrical work shall be installed in proper sequence with other trades without any unnecessary delay.

Q. The Drawings are to some extent diagrammatic and indicate the general arrangement of the equipment, the runs of conduit, and the manner of connection.

R. The Contractor shall confer with all sub-contractors engaged in the construction of the project, regarding the work that may, in any way, affect his installation. Whenever interference occurs, before installing any of the work in question, the Contractor shall consult with all sub-contractors and shall come to an agreement with them as to the exact location and level of his conduit parts of his equipment.

3.2 GENERAL RESPONSIBILITIES:

A. The Contractor shall be responsible for systems and related damages possible, and shall hold harmless the Owner, the Architect and his consultants from malfunction of systems and equipment installed under this Contract as defined by the applicable state laws pertaining to real property for the period of time as defined by such laws.

B. It is the intent of these Specifications to fully cover without exception all required labor and materials so that the finished work will be delivered to the Owner in a complete and satisfactory working installation. Excavation, wiring, distribution, etc., shall be performed in compliance with the Contract Documents.

C. Work not specifically outlined, but reasonably incidental to the completion of the work, shall be included without additional compensation from the Owner.

D. Conflicting points in the Specifications or on the Drawings shall be called to the attention of the Architect prior to the execution of the Contract.

3.3 STORAGE AND PROTECTION OF EQUIPMENT

A. Conventional electrical construction materials such as building wire, outlet and junction boxes, wiring devices, conduit, lighting fixtures, fittings, etc., shall be stored in construction buildings, covered trailers or portable covered warehouses. Any equipment subject to damage or corrosion from excessive moisture shall be stored in dry, heated areas. Any equipment containing plastic or material subject to damage caused by excessive heat or sunlight shall be stored to prevent such damage. This includes plastic ducts and lenses.

B. Equipment damaged as a result of the above conditions shall be properly repaired at the Contractor's expense or shall be replaced at the Contractor's expense, if, in the opinion of the Engineer the equipment has been damaged to such an extent it cannot operate properly after repairs are made.

C. All electrical enclosures exposed to construction damages such as paint spots, spackling or plaster spatter, grout splashes, waterproofing compound, tar spots or runs and pipe covering compound splashes, shall be completely covered and protected against damage.

D. In the event leakage into the building of any foreign material or fluid occurs or may occur, the Contractor shall take all steps as described above to protect any and all equipment.

E. After connections to electrical equipment are complete and the equipment is ready for operation, all construction debris shall be removed from all enclosures. Such debris includes dust, dirt, wire clippings, tape and insulation removed in order to make the connection.

3.4 ELECTRICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
   1. Coordinate electrical systems, equipment, materials, and installation with landscape/irrigation contractor(s).
   2. Verify all dimensions by field measurements.
   3. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination

requirements conflict with individual system requirements, refer conflict to the Engineer.

4. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components where installed exposed in finished spaces.
5. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. All equipment and disconnects shall maintain proper working space to conform to NEC.
6. Install systems, materials, and equipment giving right-of-way priority to systems that require installation at a specified slope.
7. Arrange for chases, slots and openings in other building components during progress of construction, to allow for electrical installation.
8. Space, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the work.

3.5 SUPERVISION AND COORDINATION:

A. Provide complete supervision, direction, scheduling and coordination of all work under the contract, including that of subcontractors, using full attention and the best skill. Be responsible for all work and make all subcontractors, suppliers and manufacturers fully aware of all requirements of the contract.

B. The Contractor shall coordinate all electrical rough-ins with approved shop drawings and coordination drawings. Any rough-in installed without complete coordination shall be at the Contractor's risk and expense.

C. Coordinate the spacing and arrangement of lighting fixtures, diffusers, grilles and access panels in ceilings to establish a symmetrical pattern.

D. Where a discrepancy exists within the Specifications or drawings or between the Specifications and Drawings, the more stringent (or costly) requirement shall apply until a clarification can be obtained from the Engineer. Failure to clarify such discrepancies with the Engineer will not relieve the Contractor of the responsibility of conforming to the requirements of the Contract.

E. Failure of the Contractor to obtain a full and complete set of Contract Documents (either before or after bidding) will not relieve the Contractor of the responsibility of complying with the intent of the Contract Documents.

F. Coordinate Division 26 work with all trades.

G. Install work with proper clearances and access. Carefully examine all contract drawings and fit the work in each location without substantial alteration. Where departures are proposed or required, submit detailed drawings for acceptance. The right is reserved to make reasonable changes in location of equipment, conduit and wiring up to the time of rough-in or fabrication.

H. Coordinate light switch locations with door swings prior to rough-in. No switches permitted behind doors.

I. Coordinate electrical work with architectural items and equipment.

N. It shall be the responsibility of the Contractor to obtain complete instructions for connections.

3.6 GUARANTEE:

A. Guarantee obligations shall be as hereinbefore specified in the GENERAL AND SPECIAL CONDITIONS of these specifications, except as follows:
    1. Guarantee the complete electrical system free from all mechanical and electrical defects for the period of three (3) years beginning from the day of substantial completion of the work by the Architect. Refer to the Alternates specification section for additional years of guarantee. In all cases (base bid or alternates) specific equipment or materials warranties shall be guaranteed as stated hereinafter or as indicated on the drawings.
    2. Also, during the guarantee period, be responsible for the proper adjustments of all systems, equipment and apparatus installed by the Contractor and do all work necessary to ensure efficient and proper functioning of the systems and equipment.
    3. Upon receipt of notice from the Owner of failure of any part of the electrical installation during the guarantee period, new replacement parts shall be furnished and installed promptly at no cost.
    4. Warranty From the Manufacturer: Contractor shall obtain all warranty papers and records from the Original Equipment Manufacturer according to their warranty policy and deliver the same to the Owner. Contractor shall fulfill all the Original Manufacturer's requirements to validate the warranty as offered by the Original Equipment Manufacturer.

B. Provide 24-hour service for any and all warranty problems experience in the operation of the equipment provided.

C. Any equipment or system in need of warranty work whether during regular hours or on an emergency basis, shall be immediately serviced and repaired. The warranty work and guarantee shall include all parts and labor and shall be furnished at no cost to the Owner.

D. The Contractor shall guarantee to make good any and all defects in his work, exclusive of lamps, which may develop due to defective workmanship or materials, within three years from the date of final acceptance of the work by the Owner.

E. In addition to the warranty and correction of work obligations contained in the General and supplementary Conditions, correct the work of the system as embraced by the Specification, free from Mechanical and Electrical defects for the warranty period beginning from the day of acceptance of the building by the Architect for the beneficial use of the Owner.

F. During the warranty period, take responsibility for the proper adjustments of systems, equipment and apparatus installed and perform work necessary to ensure the efficient and proper functioning of the systems and equipment.

G. Certain items of equipment hereinafter specified shall be guaranteed for a longer time than the general warranty period. These guarantees shall be strictly adhered to and the Contractor shall be responsible for service or replacement required in connection with guarantee of these items. These guarantees shall commence on the same date as the final acceptance by the Architect.

H. Submission of a bid proposal for this Project warrants that the Contractor has reviewed the Contract Documents and has found them free from ambiguities and sufficient for the construction and proper operation of systems installed for this project. If discrepancies are found, have them clarified by Addendum.

I. It is possible that certain areas of the building or certain systems will be accepted at a time different than as specified. The date of acceptance by the Architect for beneficial use of the Owner for these building areas or systems will be adjusted accordingly.

3.7 SCHEDULING OF WORK:

A. The Contractor shall not be permitted to do any work in any area of any occupied building during normal hours, except in areas specifically assigned.

B. Coordination of work by the Contractor is essential such that power outages are kept to a minimum in quantity and duration. All required outages shall be approved by the Owner for optimum time scheduling. Written notice of not less than 15 calendar days shall precede all power outages. Utility disruptions during normal school hours are prohibited.

3.8 TEMPORARY FACILITIES:

A. General: Refer to the Division 1 Sections for general requirements on temporary facilities.

B. Description: Furnish and install the necessary metering and distribution equipment or an adequate, 3-phase, 4 wire temporary service and all temporary wiring, including step-down or step-up dry-type transformers. Exact requirements for temporary service will be determined by the Contractor.

C. The Contractor's attention is directed to the Occupational Safety and Health Act, Americans with Disabilities Act and NEC requirements for electrical work on construction sites.

D. Materials: Lights at each floor in each stair. At least one light outlet per 1200 square feet on each floor, exclusive of stairs.
   1. One 20-ampere circuit for each 7500 square feet of gross floor area per floor to which various trades may attach their cords.
   2. One temporary 220v power online in corridor (each elevator lobby) including connections to saws, fireproofing equipment and wood sanding equipment, if required.
   3. Power for testing and operating of elevators.
   4. Temporary lighting for stripping forms for all floors below grade.
   5. Power for crane operation.

E. Installation: Temporary lighting shall provide minimum foot candle levels for construction as follows:

AREA	FOOT CANDLE LEVEL
General construction area lighting, corridors, hallways and exit ways.	10
Electrical equipment rooms, active storerooms, shops, locker and dressing areas	10

F. The Contractor shall pay for all material and labor to provide and maintain temporary service.

G. The Contractor shall obtain and shall pay for temporary electrical service for construction power.

H. Provide all underground and/or overhead equipment, transformers, overcurrent devices, wires, connections, etc., for obtaining power from utility company lines.

I. Remove all temporary power installations and connections after permanent power is established and/or prior to completion of the project.

J. Contractor responsible for any and all temporary utility power connection fees.

3.10 PAINTING AND FINISHES:

A. Provide protective finishes on all materials and equipment. Use coated or corrosion-resistant materials, hardware and fittings throughout the work. Paint bare, untreated ferrous surfaces with rust-inhibiting paint. All exterior components including supports, hangers, nuts, bolts, washers, vibration isolators, etc., shall be galvanized or stainless steel.

B. Clean surfaces prior to application of coatings, paint, or other finishes.

C. Provide factory-applied finishes where specified. Unless otherwise indicated factory-applied paints shall be baked enamel with proper pre-treatment.

D. Protect all finishes and restore any finishes damaged as a result of work under Division 26 to their original condition.

E. The preceding requirements apply to all work, whether exposed or concealed.

F. Remove all construction marking and writing from exposed equipment, conduit, and building surfaces. Do not paint manufacturer's labels or tags.

G. All exposed conduit, etc., shall be painted, except in electrical rooms, mechanical rooms, storage rooms, and crawl spaces. Colors shall be selected by the Architect and conform to ANSI Standards.

H. Submit color of factory-finished equipment for approval prior to ordering.

3.11 PROTECTION OF WORK:

A. Protect work, material and equipment from weather and construction operations before and after installation. Properly store and handle all materials and equipment.

B. Cover temporary openings in conduit and equipment to prevent the entrance of water, dirt, debris, or other foreign matter.

C. Cover or otherwise protect all finishes.

D. Replace damaged materials, devices, finishes and equipment.

3.12 OPERATION OF EQUIPMENT:

A. Clean all systems and equipment prior to initial operation for testing, retesting, or other purposes. Set, adjust, and test all equipment in accordance with manufacturer's instructions. Do not operate equipment unless all proper safety devices or controls are operational. Provide all maintenance and service for equipment that is authorized for operation during construction.

B. Where specified, or otherwise required, provide the services of the manufacturer's factory-trained servicemen or technicians to start up the equipment.

C. Do not use electrical systems for temporary services during construction unless authorized in writing by the Owner. Where such authorization is granted, temporary use of equipment shall in no way limit or otherwise affect warranties or guaranty period of the work.

D. Upon completion of work, clean and restore all equipment to new conditions; replace expendable items such as filters.

3.13 TESTING AND ADJUSTMENT

A. Perform all tests which are specified or required to demonstrate that the work is installed and operating properly. Where formal tests are required, give proper notices and perform all necessary preliminary tests to assure that the work is complete and ready for final test.

B. Adjust all systems, equipment and controls to operate in a safe, efficient and stable manner.

C. On all circuits, 600 volts or less, provide circuits that are free from ground faults, short circuits and open circuits.

D. Other tests of a specific nature for special equipment shall be as specified under the respective equipment.

3.14 IDENTIFICATIONS, ELECTRICAL DIAGRAMS AND OPERATING INSTRUCTIONS:

A. Contractor shall submit for approval schematic diagrams of each electrical system installed in the building. Diagrams shall indicate device location, service, type, make, model number and the identification number of each device in the particular system. Following approval by all authorities, the diagrams shall be framed, mounted under glass and hung in each Main Equipment Room where directed. Contractor shall deliver the tracing or sepia from which the diagrams were reproduced to the Owner.

B. All equipment shall be plainly tagged.

C. All items of equipment, including motor starters, panels, etc., shall be furnished with white letters and numbers on black plastic identification plates or aluminum letters and numbers on black engraved aluminum identification plates. Lettering shall be a minimum of 1/4" high. Identification plates shall be securely affixed to each piece of equipment, starters, panels, etc., by screws or adhesive (Tuff-Bond #TB2 or as approved equal). Pressure sensitive tape backing is prohibited.

D. Provide three (3) copies and electronic copies of operating and maintenance instructions for all principal items of equipment furnished. This material shall be bound as a volume of the "Record and Information Booklet" as hereinafter specified.

3.15 RECORD DRAWINGS AND SPECIFICATIONS:

A. Upon completion of the Electrical installations, the Contractor shall deliver to the Engineer one complete set of prints of the Electrical Contract Drawings which shall be legibly marked in red pencil to show all Addenda, approved Shop Drawings, Change Orders, changes and departures of the installation as compared with the original design. They shall be suitable for use in preparation of Record Drawings. Provide electronic copies of each.

B. The Contractor shall provide a record specification including all Addenda and other modifications. Record substantial variations in actual work performed. Identify all substitutions.

- END OF SECTION 26 05 01 -

SECTION 26 05 05
ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SCOPE

A. Electrical demolition shall be carried out per the Contract Documents. In addition to work indicated on the Drawings, remove all unused conduit and wiring previously abandoned above ceiling, and provide proper support for all existing / new low voltage wiring above the ceilings per NEC. Wiring shall not be laying directly upon the ceiling systems.

B. Provide all cutting and patching for electrical construction.

C. Provide temporary service and provisions to maintain existing systems.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

2.2 FIELD SERVICES AND SURVEYS

A. The Contractor shall examine the site, determine all conditions and circumstances and gather all data and information required for the work.

B. The Contractor shall survey all new and existing wiring, circuitry, cabling, equipment and devices. Data gathering shall include, but not be limited to, equipment nameplate information, ratings, voltage, wiring configurations, conductor lengths, conductor routing, conductor sizes, equipment connections, and other information as required to maintain existing systems.

C. The Contractor shall provide complete field investigations to determine existing and new conductor, cable, and conduit routing, points of connections, and tracing of existing systems.

D. The Contractor shall assume that all information shall be obtained from field surveys and not from Owner's records. If Owner's records are made available to the Contractor, for information only, the Contractor shall verify the Owner's Records with the existing conditions.

E. Field investigations include, but are not limited to, performing surveys, opening of equipment enclosures, and other work as required to maintain existing systems.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to the Engineer before disturbing existing installation.

B. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with the Owner. Also, coordinate utility service outages with Utility Company.

3.3 CONNECTIONS AND ALTERATIONS TO EXISTING SYSTEMS

A. Keep all existing electrical systems in operation during the progress of the work. Provide temporary electrical connections to systems of equipment, etc., where necessary to maintain continuous operation until the new systems and equipment are ready for operation.

B. When existing electrical work is removed, remove all conduit, ducts, supports, etc. to a point below the finished floors or behind finished walls and cap. Such points shall be far enough behind finished surfaces to allow for the installation of the normal thickness of finished material.

C. When the work specified hereunder connects to any existing equipment, conduit, wiring, etc., perform all necessary alterations, cuttings, fittings, etc., of the existing work as may be necessary or required to make satisfactory connections between the new and existing work and leave the complete work in a finished and workmanlike condition.

D. When the work specified under other divisions necessitates relocation of existing equipment, conduits, wiring, etc., perform all work and make all necessary changes to existing work as may be required to leave the completed work in a finished and workmanlike condition.

E. Contractor shall be responsible for removing and replacing existing ceiling tile within the lay-in ceiling areas as required. Contractor shall provide all necessary cutting and fitting of bushed holes for cable passage through tiles. Any tiles damaged during the Contract shall be replaced with like kind at no cost to the Owner.

F. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations. In particular, all security and life safety systems must be maintained in operation at all times as required by the Owner. This includes security, safety lighting, and fire alarm.

G. Existing Electrical Service: Maintain existing system in service. Disable system only to make switchovers and connections. Obtain written permission from Owner at least 15 days before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area. The Contractor shall be responsible for maintaining electrical service to all areas of the building during construction. The Contractor shall provide temporary power and lighting for areas of the building that are under construction and shall maintain power for all systems in areas of he building not under construction. The contractor shall be responsible for the relocation of all electrical equipment and its associated wiring as required by construction phasing.

H. Emergency Power: The Contractor shall provide temporary emergency lighting along paths of egress in completed areas through use of the existing emergency power system or temporary battery pack fixtures as required by NFPA and the local authority having jurisdiction. Outages required for relocation and/or extension of the existing electrical systems shall be kept to a minimum duration, performed while building is not occupied and scheduled in advance with the Owner. The Contractor shall fully examine the existing systems, determine all existing conditions and circumstances under which the work shall be performed and make all allowances for same. No additional cost to the Owner shall be permitted for the Contractors' failure to do so.

I. The Contractor shall trace all circuits and controls to be disconnected to ensure that vital services to other areas are not interrupted.

3.4 PROTECTION

A. Provide protection for all existing and new cabling. Provide inner duct, conduit or other suitable means of protection to prevent damage to cables located in renovated areas.

B. Damage to wiring, cabling or equipment shall be repaired by skilled mechanics for the trade involved at no additional contract amount.

C. Fixtures, materials and equipment shall be protected at all times. The Contractor shall make good any damage caused either directly or indirectly by his workmen. Conduit openings shall e closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water and chemical or other injury. At the completion of all work, the fixtures, materials and equipment shall be thoroughly cleaned and turned over in a condition satisfactory to the Owner.

D. Damage: Where wiring, raceways, lighting fixtures, devices or equipment to remain is inadvertently damaged or disturbed, cut out and remove damaged section and provide new of equal or capacity or quality.

3.5 ELECTRICAL DEMOLITION

A. Remove from the premises and dispose of all existing wiring, conduit, material, fixtures, devices, equipment, etc., not required for re-use or re-installation.

B. Deliver on the premises where directed existing material and equipment which is removed and is desired by the Owner or is indicated to remain the property of the Owner.

C. All other equipment and materials which are removed shall become the property of the Contractor and shall be removed by him from the premises.

D. Where electrical equipment is removed, also remove all wiring back to source panelboard or switch or to last remaining device on the same circuit. All conduit, hangers, supports, etc., shall also be removed unless otherwise noted. Such conduit may remain to be reused for new work provided said conduit is of the proper size and type as that specified and, in a condition, acceptable to Engineer and Owner.

E. Any conduit abandoned in concrete slabs, walls, or other inaccessible locations shall be left empty except for a nylon pull wire. Ends shall be capped with push plugs for future use.

F. Where an existing system is indicated to be removed, the Contractor shall provide complete removal of entire system including all wiring, conduit, and connected/associated fixtures and devices. The system shall be removed in its entirety unless otherwise noted.

3.6 EXISTING CONDUIT WORK

A. Remove all abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces. Remove conduit back to point of penetration/exposure.

B. Remove concealed abandoned raceway to its source.

C. Abandoned Work: buried electrical work abandoned in place, shall be cut out approximately 2 inches beyond the face of adjacent construction, capped and the adjacent surface patched to match the existing finish.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if raceway servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

E. Remove all abandoned wiring from exiting conduits and ductbanks.

F. Contractor shall provide all cutting and patching required to connect to and extend existing conduits, wiring, circuits, etc.

G. Clean and repair existing raceway and boxes that remain or are to be reinstalled.

H. Remove all abandoned wiring from existing conduits and ductbanks. Abandoned wiring that cannot be removed shall be tagged at each end as “Abandoned”.

I. Contractor shall provide all cutting and patching required to connect to and extend existing conduits, wiring, circuits, etc.

3.7 CLEANING AND REPAIR

A. Remove all abandoned and unused wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes. Remove abandoned and unused cabling and wiring back to the source.

B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes if wire and cable servicing them is abandoned and removed. Provide blank cover for abandoned boxes that are not removed.

C. Ensure access to existing wiring connections which remain active and which require access. Modify installation or provide access panel as appropriate.

D. Extend existing circuits using materials and methods compatible with existing electrical installations or as specified.

E. Clean and repair existing wire and cable that remain or is to be reinstalled.

F. Provide supports for all wiring and cabling to remain as required by the NEC.

G. Contractor shall provide field services for tracing out of all existing circuits to be maintained. Contractor shall locate, trace and label, all existing circuit being reused.

3.8 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work to meet all requirements of these specifications.

B. If certain raceways and boxes are abandoned but not scheduled for removal, those items must be shown on the As-Built Drawings.

C. Remove, relocated, and extend existing installations to accommodate new construction.

D. Remove abandoned wiring to source of supply.

3.9 CLEANING AND REPAIR

A. Clean and repair existing equipment and materials that remain or are to be reused.

B. Panelboards: Provide typed circuit directory showing revised circuiting arrangement.

C. Provide new labels on all existing electrical equipment being re-used.

- END OF SECTION 26 05 05 -

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

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Metal-clad cable, Type MC, rated 600 V or less.
3. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 260533 “Raceways and Boxes for Electrical Systems”

1.3 DEFINITIONS

A. RoHS: Restriction of Hazardous Substances.

1.4 INFORMATIONAL SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location and termination locations.

1.5 QUALITY ASSURANCE

A. Electrical devices, accessories and components; are certified by a testing agency approved by the local authority having jurisdiction, and are listed and labeled per NFPA 70 Article 100.

B. Installation shall comply with applicable nation, state and local electrical codes and NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

1. Alpha Wire Company.
2. American Bare Conductor.
3. Belden Inc.
4. Cerro Wire LLC.
5. Southwire Company.
6. WESCO.

2.2 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

D. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

2.3 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. RoHS compliant.
4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Circuits:

1. Single circuit.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Ground Conductor: Insulated.

F. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.

G. Armor: Steel; interlocked.

2.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

1. 3M Electrical Products.
2. AFC Cable Systems; a part of Atkore International.
3. Gardner Bender.
4. Hubbell Power Systems, Inc.
5. Ideal Industries, Inc.
6. O-Z/Gedney; a brand of Emerson Industrial Automation.
7. TE Connectivity Ltd.
8. Thomas & Betts Corporation; A Member of the ABB Group.

C. Connectors:

1. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with compression fittings, designed to connect conductors specified in this Section.
2. Split Bolt & Set Screw Connectors: Not Acceptable.
3. Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.
4. Solderless Pressure Connectors: High copper alloy terminal. May be used only for cable termination to equipment pads or terminals. Not approved for splicing.
5. All wire connectors used in underground or exterior pull boxes shall be gel-filled twist connectors or a connector designed for damp and wet locations.
6. Compression (crimp) Connectors: Long barrel; seamless, tin-plated electrolytic high conductivity copper tubing, internally beveled barrel ends. Connector shall be clearly marked with the wire size and type and proper number and location of crimps. Mechanical Connectors: Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.
7. Heat shrinkable tubing shall meet the requirements of ANSI C119.1-1986 for buried connections to 90°C and shall be material flame-retarded per IEEE 383 “Vertical Tray Flame Test”. Motor connection kits shall consist of heat-shrinkable, polymeric insulating material over the connection area and a high dielectric strength mastic to seal the ends against ingress of moisture and contamination. Motor connection kits shall accommodate a range of cable sizes for both in-line and stub-type configurations. Connection kits shall be independent of cable manufacturer’s tolerances

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: Two hole with standard barrels.
3. Termination: Compression.

E. Wire Connectors:

1. Wire nuts installed in wet locations, exterior, etc., shall be self-contain, waterproof and corrosion-proof units incorporating prefilled silicone grease to block out moisture and air.
2. Connectors shall be UL listed appropriately sized according to manufacturer's recommendations for the suitable wire sizes and voltage ratings.
3. Connectors' body shall have a color-coded outer shell.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

H. Type MC Luminary Cable may be used in short lengths (6-foot maximum) for final connections to lighting fixtures and may be used between light fixtures for 0-10V control.

I. Class I Control Circuits: Type THHN-THWN, in raceway.

J. Class II 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. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values. Lubricant shall be water based, no Yellow 77.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

G. Branch circuits of 120V, wire size shall be as follows:

1. Homerun from panelboard to first outlet: size as indicated on E0.1 “20 Ampere Circuits” Chart.
2. From first outlet to other outlets: No. 12.

H. All circuits for exterior electric work shall be No. 10 (minimum) and contain and extra No. 10 copper ground conductors. All exterior wiring shall be installed in conduit as specified above, unless otherwise noted as larger on the Drawings.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material.

C. Splices shall be done in junction boxes and/or outlet boxes only.

1. Conductors No. 10 and smaller, use wire connectors.
2. Conductors No. 8 and larger, shall be of the type indented into the conductor by means of a hand or hydraulic pressure tool.

D. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

- END OF SECTION 26 05 19 -

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Ground bonding common with lightning protection system.
3. Foundation steel electrodes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
    a. Test wells.
    b. Ground rods.
    c. Ground rings.
    d. Grounding arrangements and connections for separately derived systems.
2. Instructions for periodic testing and inspection of grounding features at test wells ground rings grounding connections for separately derived systems based on NETA MTS NFPA 70B.
    a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
    b. Include recommended testing intervals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. 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.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries, Inc.; Electrical Products Division, LLC.
6. Harger Lightning & Grounding.
7. ILSCO.
8. O-Z/Gedney; a brand of Emerson Industrial Automation.
9. Robbins Lightning, Inc.
10. SIEMENS Industry, Inc.; Energy Management Division.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM 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, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

I. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

J. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

K. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

L. Straps: Solid copper, copper lugs. Rated for 600 A.

M. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal one two-piece clamp.

N. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

O. Water Pipe Clamps:

1. Mechanical type, two pieces with stainless-steel bolts.

a. Material: Die-cast zinc alloy.
b. Listed for direct burial.

2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m).

B. Ground Plates: 1/4 inch (6 mm) thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 4/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

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 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. 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.

F. Signal and Communication Equipment: 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.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-24-inch (6-by-50-by-600-mm) grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.6 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 Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. 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 Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
3. Substations and Pad-Mounted Equipment: 5 ohms.
4. Manhole Grounds: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

- END OF SECTION 26 05 26 -

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 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved:

B. Seismic Qualification Certificates: For hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.

C. Welding certificates.

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 slotted metal angle and U-channel systems by one of the following:
    a. Thomas & Betts Corporation.
    b. Alstrut.
    c. Unistrut; Diversified Products
    d. Power-Strut.
2. Manufacturers: Subject to compliance with requirements, provide conduit sealing bushings and accessories by one of the following:
    a. Bridgeport Fittings
    b. GS Metals, Corporation

c. O-Z / Gedney
d. Raco, Inc.

3. Material: Pre-galvanized steel.
4. Channel Width: 1-1/4 inches (31.75 mm).
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
9. Channel Dimensions: Selected for applicable load criteria.

B. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

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:
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.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.
7. Powder actuated fasteners and drive pin type fasteners are not acceptable.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.

B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

D. 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.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "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. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

B. Touch Up: Clean welds and abraded areas of shop paint. Paint exposed areas after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA1.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

- END OF SECTION 26 05 29 -

SECTION 26 05 33
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.

1.2 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.

5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.
10. Steel City.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

G. EMT: Comply with ANSI C80.3 and UL 797.

H. FMC: Comply with UL 1; zinc-coated steel.

I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel.
b. Type: Compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

K. Joint Compound for IMC, GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

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:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.

5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ENT: Comply with NEMA TC 13 and UL 1653.

D. RNC: Type EPC-40-PVC complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. LFNC: Comply with UL 1660.

F. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

G. Fittings for LFNC: Comply with UL 514B.

2.3 BOXES, ENCLOSURES, AND CABINETS

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:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep) 4 inches by 2-1/8 inches by 2-1/8 inches deep (100 mm by 60 mm by 60 mm deep).

K. Gangable boxes are allowed.

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC Raceway locations include the following:

a. Loading dock.
b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
c. Mechanical rooms.
d. Boiler rooms.
e. Crawl space

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.

5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

B. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

C. Aluminum conduit is prohibited.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems" for hangers and supports.

D. Arrange stub-ups so curved portions of bends are not visible above finished slab.

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

G. Support conduit within 12 inches ((300 mm)) of enclosures to which attached.

H. Raceways Embedded in Slabs:

1. Conduit shall not be permitted to be concealed in concrete, below slabs-on-grade or underground unless specifically noted on drawings.

2. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
3. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
4. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
5. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
6. Change from RNC, Type EPC-40-PVC to GRC before rising above floor, including into wall cavity.

I. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35-mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300-mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

O. Surface Raceways:

1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
2. Secure surface raceway with two hole straps at intervals not exceeding 32 inches (813-mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

P. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

Q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

R. Expansion-Deflection Fittings: Provide an expansion/deflection fitting in each concealed or exposed electrical run crossing a building expansion joint. Fittings shall be complete with bronze end couplings, neoprene sleeve, tinned copper braid integral bonding jumper and stainless steel bands. Expansion/deflection fittings shall be suitable for the size and type of conduit run they connect. Bonding jumper shall comply with NEC and UL requirements.

1. Expansion/deflection fitting shall accommodate the following movements without collapsing or fracturing the conduit and damaging the wires it contains:

   a. Axial expansion or contraction up to 3/4-inch.
   b. Angular misalignment of the axes of the conduits up to 30 degrees in all directions.
   c. Parallel misalignment of the axes of the conduits up to 3/4-inch in all directions.

2. Expansion/Deflection fitting shall be OZ/Gedney Type DX or approved equal by Crouse Hinds (Type XD).

S. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

T. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.

U. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

W. Locate boxes so that cover or plate will not span different building finishes.

X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

Z. Set metal floor boxes level and flush with finished floor surface.

AA. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 26 Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 7 Section "Penetration Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

3.6 GROUNDING

A. Ground underground ducts and utility structures according to Division 26 Section "Grounding."

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.8 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

- END OF SECTION 26 05 33 -

SECTION 26 05 44
SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:
   a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
   b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following 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 Company (The).
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. HOLDRITE.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
    a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
    b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 3 inches (76.2 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

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

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

- END OF SECTION 26 05 44 -

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

1. Color shall be factory applied.
2. Colors for 208/120-V Circuits:
    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.
    d. Neutral: White.
3. Colors for 480/277-V Circuits:
    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.
    d. Neutral: Gray.
4. Color for Equipment Grounds: Green.
5. Colors for Isolated Grounds: Green with white stripe.

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

2.3 LABELS

A. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter and that stay in place by gripping action.

1. Manufacturers:
    a. Brady Corporation.
    b. Hellermann Tyton.
    c. Marking Services, Inc.
    d. Panduit Corp.
    e. Seton Identification Products.

B. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3 mil (0.08 mm) thick, multicolor, weather and UV resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Manufacturers:
    a. Brady Corporation.
    b. Hellermann Tyton.
    c. Marking Services, Inc.
    d. Panduit Corp.
    e. Seton Identification Products.

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameter and that stay in place by gripping action.

1. Manufacturers:

a. Brady Corporation.
b. Hellermann Tyton.
c. Marking Services, Inc.
d. Panduit Corp.

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

1. Manufacturers:

a. Carlton Industries, LP
b. Champion America
c. Hellermann Tyton
d. Ideal Industries, Inc.
e. Marking Services, Inc.
f. Panduit Corp.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.

1. Manufacturers:

a. Brady Corporation.
b. Carlton Industries, LP
c. Emedeo
d. Marking Services, Inc.

C. Floor Marking Tape: 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

1. Manufacturers:

a. Carlton Industries, LP
b. Seton Identification Products.

D. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.6 SIGNS

A. Baked-Enamel Signs:

1. Manufacturers:

a. Carlton Industries, LP
b. Champion America

c. Emedco
d. Marking Services, Inc.

2. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
3. 1/4-inch (6.4-mm) grommets in corners for mounting.
4. Nominal Size: 7 by 10 inches (180 by 250 mm).

B. Metal-Backed Butyrate Signs:

1. Manufacturers:

a. Carlton Industries, LP
b. Champion America
c. Emedco
d. Marking Services, Inc.

2. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch (1-mm) galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
3. 1/4-inch (6.4-mm) grommets in corners for mounting.
4. Nominal Size: 10 by 14 inches (250 by 360 mm).

C. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers:

a. Carlton Industries, LP
b. Champion America
c. Emedco
d. Marking Services, Inc.

2. Engraved legend.
3. Thickness:

a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick).
b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
c. Engraved legend with white letters on a black background.
d. Punched or drilled for mechanical fasteners with 1/4-inch (6.4-mm) grommets in corners for mounting.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 CABLE TIES

1. Manufacturers:

a. Hellerman Tyton
b. Ideal Industries, Inc.
c. Marking Services, Inc.
d. Panduit Corp.

B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).

3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer, emergency power.

L. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

M. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. Paragraphs below specify requirements unique to identification products.

N. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

O. Self-Adhesive Labels:

1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

P. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

Q. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

R. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

S. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

T. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

U. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

V. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

W. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

X. Cable Ties: General purpose, for attaching tags, except as listed below:
1. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 20 A and 120 V to Ground: Identify with snap-around labels applied in bands.

1. Locate identification label at 10 foot (3-m) maximum intervals.

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels with the conductor or cable designation, origin, and destination.

F. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive wraparound labels with the conductor designation.

G. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

H. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

I. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
    a. Power-transfer switches.
    b. Controls with external control power connections.

K. Operating Instruction Signs: Laminated acrylic or melamine plastic signs.

L. Emergency Operating Instruction Signs: Laminated acrylic or melamine plastic signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer and emergency power.

M. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.

- END OF SECTION 26 05 53 -

SECTION 26 28 13
FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:

a. Control circuits.
b. Enclosed controllers.
c. Enclosed switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data.

1.5 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bussmann, an Eaton business.
2. Edison; a brand of Bussmann by Eaton.
3. Littelfuse, Inc.
4. Mersen USA.

B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
2. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, time delay.
3. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.

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

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Feeders: Class J, time delay.
2. Motor Branch Circuits: Class RK1, time delay.
3. Other Branch Circuits: Class RK1, time delay.
4. Control Transformer Circuits: Class CC, time delay, control transformer duty.
5. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s) as indicated in the field by Architect/Owner's Representative.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

- END OF SECTION 26 28 13 -

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Data: Certificates, for enclosed switches and circuit breakers, accessories, and components, from manufacturer.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two (2) year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 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."

2.2 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.3 MANUFACTURERS:

A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D; by Schneider Electric or comparable product by one of the following:

1. Eaton.
2. General Electric Company.
3. SIEMENS Industry, Inc.; Energy Management Division.

2.4 FUSIBLE SWITCHES

A. Type HD, Heavy Duty:

1. Single throw.
2. Three pole.
3. 600-V ac.
4. 1200 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Accessories (Required per device):

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: Compression type, suitable for number, size, and conductor material.

C. Optional Accessories (As specified on Drawings):

1. Auxiliary Contact Kit: One NO/NC (Form “C”) auxiliary contact, arranged to activate before switch blades open. Contact rating – 120-V ac.
2. Service-Rated Switches: Labeled for use as service equipment.

2.5 NONFUSIBLE SWITCHES

A. Type HD, Heavy Duty:

1. Single throw.
2. Three pole.
3. 600-V ac.
4. 1200 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Accessories (Required per device):

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: Compression type, suitable for number, size, and conductor material.

C. Optional Accessories (As specified on Drawings):

1. Auxiliary Contact Kit: One NO/NC (Form “C”) auxiliary contact, arranged to activate before switch blades open. Contact rating – 120-V ac.
2. Service-Rated Switches: Labeled for use as service equipment.

2.6 MOLDED-CASE CIRCUIT BREAKERS

A. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

B. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

C. MCCBs shall be equipped with a device for locking in the isolated position.

D. Lugs shall be suitable for 140 deg F (60 deg C) rated wire on 100-A circuit breakers and below. 167 deg F (75 deg C) rated wire, sized according to the 167 deg F (75 deg C) temperature rating in NFPA 70.

E. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.

F. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

G. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings for circuit breaker frame sizes 400A and larger:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I-squared t response.

H. Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

I. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Compression type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
7. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
8. Alarm Switch: One NO/NC contact that operates only when circuit breaker has tripped.
9. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
10. Electrical Operator: Provide remote control for on, off, and reset operations.
11. Accessory Control Power Voltage: Integrally mounted, self-powered.

2.7 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1).

C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.

D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 4X, stainless steel.
3. Kitchen, Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4X, stainless steel.

3.3 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in fusible devices.

F. Comply with NFPA 70 and NECA 1.

3.4 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.

1. Visually and Mechanical inspect all equipment on project prior to installation.
2. Correct malfunctioning units on-site, with new units.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in approved Coordination Study Shop Drawing.

- END OF SECTION 26 28 16 -