PROJECT MANUAL

14th STREET YARD
NEW JACKING PADS
213 West Roosevelt Road
Chicago, Illinois 60607

Amtrak Task Order: LA#328

National Railroad Passenger Corporation
30th Street Station
Philadelphia, Pennsylvania 19104

Date: April 19, 2017

Project No. 14435.004
# TABLE OF CONTENTS

## DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>SEALS PAGE</td>
<td>01</td>
</tr>
</tbody>
</table>

## DIVISION 01 - GENERAL REQUIREMENTS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 00</td>
<td>SUMMARY</td>
<td>06</td>
</tr>
<tr>
<td>01 22</td>
<td>UNIT PRICES</td>
<td>02</td>
</tr>
<tr>
<td>01 25</td>
<td>SUBSTITUTION PROCEDURES</td>
<td>04</td>
</tr>
<tr>
<td>01 26</td>
<td>CONTRACT MODIFICATION PROCEDURES</td>
<td>02</td>
</tr>
<tr>
<td>01 29</td>
<td>PAYMENT PROCEDURES</td>
<td>03</td>
</tr>
<tr>
<td>01 31</td>
<td>PROJECT MANAGEMENT AND COORDINATION</td>
<td>10</td>
</tr>
<tr>
<td>01 32</td>
<td>CONSTRUCTION PROGRESS DOCUMENTATION</td>
<td>10</td>
</tr>
<tr>
<td>01 33</td>
<td>SUBMITTAL PROCEDURES</td>
<td>12</td>
</tr>
<tr>
<td>01 35</td>
<td>SPECIAL PROCEDURES FOR RAILROAD FACILITIES</td>
<td>07</td>
</tr>
<tr>
<td>01 40</td>
<td>QUALITY REQUIREMENTS</td>
<td>11</td>
</tr>
<tr>
<td>01 42</td>
<td>REFERENCES</td>
<td>19</td>
</tr>
<tr>
<td>01 50</td>
<td>TEMPORARY FACILITIES AND CONTROLS</td>
<td>12</td>
</tr>
<tr>
<td>01 60</td>
<td>PRODUCT REQUIREMENTS</td>
<td>06</td>
</tr>
<tr>
<td>01 73</td>
<td>EXECUTION</td>
<td>10</td>
</tr>
<tr>
<td>01 77</td>
<td>CLOSEOUT PROCEDURES</td>
<td>05</td>
</tr>
<tr>
<td>01 78</td>
<td>PROJECT RECORD DOCUMENTS</td>
<td>04</td>
</tr>
</tbody>
</table>

## DIVISION 02 - EXISTING CONDITIONS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>SELECTIVE STRUCTURE DEMOLITION</td>
<td>05</td>
</tr>
</tbody>
</table>

## DIVISION 03 - CONCRETE

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>CAST-IN-PLACE CONCRETE</td>
<td>06</td>
</tr>
</tbody>
</table>

## DIVISION 05 - METALS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>05</td>
<td>METAL FABRICATIONS</td>
<td>03</td>
</tr>
</tbody>
</table>

## DIVISION 07 - THERMAL AND MOISTURE PROTECTION

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>07</td>
<td>JOINT SEALANTS</td>
<td>03</td>
</tr>
</tbody>
</table>

## DIVISION 09 - FINISHES

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>09</td>
<td>EXTERIOR PAINTING</td>
<td>06</td>
</tr>
</tbody>
</table>

## DIVISION 22 - PLUMBING

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT</td>
<td>02</td>
</tr>
<tr>
<td>22 15</td>
<td>GENERAL SERVICE COMPRESSED AIR PIPING</td>
<td>06</td>
</tr>
</tbody>
</table>

## DIVISION 23 – HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 13</td>
<td>STEAM AND CONDENSATE HEATING PIPING</td>
<td>06</td>
</tr>
</tbody>
</table>
**DIVISION 26 - ELECTRICAL**

26 05 00 COMMON WORK RESULTS FOR ELECTRICAL 12
26 05 03 ELECTRICAL DEMOLITION 04
26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES 07
26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS 05
26 05 33 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS 09
26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS 08

**DIVISION 31 - EARTHWORK**

31 10 00 SITE CLEARING 03
31 20 00 EARTH MOVING 06
31 50 00.23 EXCAVATION SUPPORT AND PROTECTION 07

**DIVISION 32 - EXTERIOR IMPROVEMENTS**

32 12 16 ASPHALT PAVING 04

**DIVISION 33 - UTILITIES**

33 05 00 COMMON WORK RESULTS FOR UTILITIES 07

**DIVISION 34 - TRANSPORTATION**

34 11 13.23 TRACKWORK 12
34 11 26.13 BALLAST 04
34 11 26.16 SUBBALLAST 02
34 11 95 GRADE CROSSING 02

**APPENDICIES**

EXISTING REFERENCE DOCUMENTS:
- DUCT BANK DRAWINGS 44

CONSTRUCTION COST ESTIMATE 04

DESIGN ESTIMATED CONSTRUCTION SCHEDULE 01

GEOTECHNICAL REPORT 24

END OF TABLE OF CONTENTS
1.1 DESIGN PROFESSIONALS OF RECORD

CIVIL ENGINEER
Andrew J Wagstrom
License #: 062-067384

STRUCTURAL ENGINEER
Matthew J. Christensen
License #: 081-006245

MECHANICAL ENGINEER
Sam M. Issa
License #: 062-065618

ELECTRICAL ENGINEER
Martin E. Stuart
License #: 062-063973

END OF DOCUMENT 000107
SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Access to site.
5. Coordination with occupants.
6. Work restrictions.
7. Salvage rights.
8. Permits.
10. Reference documents.

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities and for site security procedures.

1.3 PROJECT INFORMATION

A. Project Identification: Inspection Pit Rehabilitation.

1. Project Location: 213 West Roosevelt Road, Chicago, Illinois 60607

B. Owner: National Railroad Passenger Corporation (Amtrak), 60 Massachusetts Avenue NE, Washington, D.C. 20002.

1. Contracting Officer: Ms. Donna M. Pasquella
2. Project Engineer: Project Engineer's status relative to the construction will be delineated in writing by the Contracting Officer prior to the pre-construction conference. "COTR" (Contracting Officer's Technical Representative) is corresponding term in General Provisions. Where the Specifications refer to the Owner, it shall mean the Project Engineer.
3. Project construction will be administered by Amtrak Deputy Division Engineer Program Management, 3rd Floor North, 30th Street Station, Philadelphia, PA 19104.

C. Engineer: Toltz King Duvall Anderson (TKDA), 444 Cedar Street, Suite 1500 Saint Paul, MN 55101. "Architect/Engineer" is corresponding term in General Provisions.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of the Project is defined by the Contract Documents and consists of the following:

1. Demolition of the existing concrete track platform between tracks 11 and 12 of an area approximately 130'-0" x 15'-0". The existing concrete is approximately 6" in depth.

2. Selective demolition of the western edge, approximately 2'-6", of the existing concrete track platforms on either side of track 12.

3. Beneath new concrete platform, removal of existing unsatisfactory soil to a minimum depth of 5'-6" below existing grade. Backfill excavation with Illinois Department of Transportation approved engineered fill.

4. Removal of the existing wooden ties and 136 lb. RE rail for a length of the jacking area plus additional length at each end of the jacking pad for sufficient excavation of the Jacking Pad foundations.

5. New Jacking Pad rail will be 136 lb. RE which will be attached to mounting plates using Pandrol "e Clip" with weld on shoulders.

6. New track rail will be 136 lb. RE attached to concrete ties using the Pandrol “FASTCLIP” system.

7. Provide new jacking pad on track 12, pad is to be approximately 130'-0" in length and 15'-0" in width.

8. Reroute existing compressed air line under the new Jacking Pad, provide containment and piping as designed.

9. Reroute existing steam line under the new Jacking Pad, provide a condensate trap, hand-hole and piping as specified.

10. Route new 480V electrical power for the portable jacks from the existing Substation 4A through existing open electrical conduit to the new portion of the platform.

11. Install new bollards, mounting brackets, and attachment point for the portable jacks power feed between tracks 12 and 13.
B. Type of Contract:

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

1.5 PHASED CONSTRUCTION

A. The Work shall be conducted in one phase for the project, with all activities taking place sequentially.

B. Before commencing Work, submit an updated copy of the Contractor's Construction Schedule showing the sequence, commencement and completion dates, and move-out and -in dates of Owner's personnel for all portions of the Work.

1.6 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

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

   1. Limits: Confine constructions operations to the areas of the platform between Tracks 11 and 12 and the platform between Tracks 12 and 13. As well as any electrical work required to run the power from Substation 4A to the platform adjacent to Track 12.

   2. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

      a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.7 COORDINATION WITH OCCUPANTS

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

   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Contracting Officer and approval of authorities having jurisdiction.
2. Submit request to Project Engineer and obtain written consent from Contracting Officer according to General Provisions for activities that will affect Owner's operations.

1.8 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

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

B. On Site Work Hours: Limit work in the existing area to normal business working hours of 7:00 a.m. to 4:00 p.m., Monday through Friday, except as otherwise indicated.


C. Utilities: Before commencing the Work, verify the location of all utility facilities in the vicinity of the Work. Hydrovac and/or test pitting is required on some utilities. Prior to beginning work affecting any utility facility, submit to Project Engineer for approval a plan for performing the work, with evidence of approval by the utility operator.

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

1. Submit request to Project Engineer and obtain written consent from Contracting Officer according to General Provisions.

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

1. Submit request to Project Engineer and obtain written consent from Contracting Officer according to General Provisions.

F. Controlled Substances: Use of tobacco products and other controlled substances on the Project site is not permitted.

G. Employee Identification: Owner will provide identification tags for Contractor personnel working on the Project site. Require personnel to utilize identification tags at all times.

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

1. Maintain list of approved screened personnel with Project Engineer.
1.9 SALVAGE RIGHTS

A. Contractor shall notify Project Engineer of any salvageable material discovered at the site. Owner reserves the right to claim such material for its own use. All salvageable material refused by Owner shall become the property of Contractor and shall be removed from the site.

B. Salvageable material claimed by Owner shall be set aside at the site, away from the general work area and protected by Contractor until such time as it is either re-used or removed as directed by Project Engineer.

C. Contractor shall properly notify Project Engineer of the discovery of scientific or historical artifacts and shall protect same until identified and removed by authorities having jurisdiction.

1.10 PERMITS

A. A provision of the Rail Passenger Service Act, 49 U.S.C. §24902(j), provides that Amtrak is exempt from state and local building, zoning, subdivision and similar laws, including those requiring permits and approvals, in connection with the construction, use or operation of any improvement undertaken by or for the benefit of Amtrak for any project that Amtrak initiates or commits to in a year in which it receives federal operating subsidies. For this project, the Authority Having Jurisdiction (AHJ) is Amtrak Deputy Chief Engineer - Structures.

1. Permits are not required.

2. If Contractor applies for permits not listed as required herein, they do so at Contractor's risk and expense. Contractor shall be responsible for all associated costs including permitting fees, modifications to work as may be requested by permitting authorities, and any other increased costs of construction or design related to Contractor's decision to apply for such permits.

3. Contractor shall review the Work and provide Owner with list of permits that would be required if the Owner were a private corporation and not Amtrak. Owner will direct Contractor which permits to obtain at Owner's expense. If Contractor applies for any other permits not so directed, they do so at Contractor's risk and expense. Contractor shall be responsible for all associated costs including permitting fees, modifications to work as may be requested by permitting authorities, and any other increased costs of construction or design related to Contractor's decision to apply for such additional permits.

4. The plans and specifications have been prepared in accordance with published state and local codes: current Chicago Building Code

5. This does not preclude Contractor from performing high quality workmanship and complying with state codes, local codes and requirements of the Americans with Disabilities Act (ADA).
B. Submit to Project Engineer written permission from property owners for the following:
   1. Temporary or permanent use of private property for field offices, work and storage areas, or any other purpose.
   2. Disposal of waste and spoil materials.

C. Furnish copy of all permits to Project Engineer.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

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

   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

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

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

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

1.12 MISCELLANEOUS PROVISIONS

1.13 REFERENCE DOCUMENTS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000
SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Sections:

1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Division 01 Section "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price 1: Removal of unsatisfactory soil and replacement with satisfactory soil material.
   1. Description: Unsatisfactory soil excavation and disposal off site and replacement with satisfactory fill material or engineered fill from off site, as required, in accordance with Division 31 Section "Earth Moving."
   2. Unit of Measurement: Cubic yard of soil excavated, based upon survey of volume removed.

B. Unit Price No. 2: Rock excavation and replacement with satisfactory soil material.
   1. Description: Classified rock excavation and disposal off site and replacement with satisfactory fill material or engineered fill from off site, as required, in accordance with Division 31 Section "Earth Moving."
   2. Unit of Measurement: Cubic yard of rock excavated, based upon survey of volume removed.

C. Unit Price No. 3: Cutting and patching of concrete floor slabs.
   1. Description: Cutting of new or existing concrete floor slabs up to 10 inches thick, removal and excavation as required and subsequent backfill, compaction, and patching of concrete in accordance with Division 01 Section "Execution." not otherwise indicated in the Contract Documents.
   2. Unit of Measurement: Square feet of concrete removed.

D. Unit Price No. 4: Miscellaneous and structural steel.
   1. Description: Miscellaneous lintels and other supports not otherwise indicated in the Contract Documents, in accordance with Division 05 Sections "Structural Steel Framing" and "Metal Fabrications."
   2. Unit of Measurement: Cost in place of pounds of fabricated steel as indicated on itemized invoice of steel supplier and verified by the Project Engineer.

END OF SECTION 012200
SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections:
   1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
   2. Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 SUBMITTALS

A. Substitution Requests: Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use Owner's Form 95.
   2. Documentation: In addition to requirements in General Provisions, show compliance with requirements for substitutions and the following, as applicable:
a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
b. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
c. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
d. Samples, where applicable or requested.
e. Certificates and qualification data, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
h. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

3. If necessary, Project Engineer will request additional information or documentation for evaluation within seven calendar days of receipt of a request for substitution. Project Engineer's review time for notification to Contractor of acceptance or rejection of proposed substitution will begin after receipt of additional information or documentation.

4. Forms of Acceptance: Change Order or ENG Form 22 for minor changes in the Work.

a. Use product specified if Project Engineer does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.
PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

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

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

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

B. Substitutions for Convenience: Project Engineer will consider requests for substitution if received within 60 calendar days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Project Engineer.

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

   a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
   b. Requested substitution does not require extensive revisions to the Contract Documents.
   c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500
SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections:

   1. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Project Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on ENG Form 22 "Change Order Action Request (Construction).

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Contracting Officer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time on Proc Form 25 "Request for Cost Proposal." If necessary, the description will include supplemental or revised Drawings and Specifications.

   1. Within time specified in Proposal Request or 20 calendar days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

      c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the
effect of the change, including, but not limited to, changes in activity
duration, start and finish times, and activity relationship. Use available total
float before requesting an extension of the Contract Time.
e. Quotation Form: Use Proc Form 27 "Cost Breakdown Sheet Request for
Change or Claim (Construction)" with the following attachments:

1) Proc Form 27A "Bill of Material (Construction).
2) Proc Form 27B "Breakdown of Labor (Construction).
3) Proc Form 27C "Breakdown of Labor Burden (Construction).
4) Proc Form 27D "Breakdown of Fringe Benefits (Construction).

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to
the Contract, Contractor may initiate a claim by submitting a request for a change to
Contracting Officer.

1. Include a statement outlining reasons for the change and the effect of the change
on the Work. Provide a complete description of the proposed change. Indicate
the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with
total amount of purchases and credits to be made. If requested, furnish survey
data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of
trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect
of the change, including, but not limited to, changes in activity duration, start and
finish times, and activity relationship. Use available total float before requesting
an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the
proposed change requires substitution of one product or system for product or
system specified.
7. Proposal Request Form: Use ENG Form 26 "Construction Contract, Change
Order/Request for Change/Supplemental Agreement."

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Unit Price Adjustment: Refer to Division 01 Section "Unit Prices" for administrative
procedures for preparation of Change Order Proposal for adjusting the Contract Sum
to reflect measured scope of unit price work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600
SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections:

1. Division 01 Section "Unit Prices" for administrative requirements governing the use of unit prices.
2. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
3. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
4. Division 01 Section "Submittal Procedures" for administrative requirements governing the preparation and submittal of the submittal schedule.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application Preparation: Complete every entry on form. Project Engineer will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.

3. Include amounts of Change Orders issued before last day of construction period covered by application.

4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

D. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.

2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

3. Provide summary documentation for stored materials indicating the following:

   a. Materials previously stored and included in previous Applications for Payment.
   b. Work completed for this Application utilizing previously stored materials.
   c. Additional materials stored with this Application.
   d. Total materials remaining stored, including materials with this Application.

E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Project Engineer by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Payment schedule.
4. Contractor's construction schedule (preliminary if not final).
5. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
6. Products list (preliminary if not final).
7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
13. Initial progress report.
15. Data needed to acquire Owner’s insurance.

G. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Updated final statement, accounting for final changes to the Contract Sum.
2. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900
SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Coordination drawings.
4. Requests for Interpretation (RFIs).
5. Project Web site.
6. Project meetings.

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

C. Related Sections:

1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Contracting Officer, Project Engineer, Architect, or Contractor seeking information from each other during construction.

1.4 COORDINATION

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

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

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

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

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

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

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

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

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 COORDINATION DRAWINGS

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

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

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.

c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.

e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.

f. Indicate required installation sequences.

g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Project Engineer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

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

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing and electrical Work. Supplement plan drawings with section drawings where required to adequately represent the Work.

2. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

3. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

4. Mechanical and Plumbing Work: Show the following:
a. Sizes and bottom elevations of piping and conduit runs, including insulation, bracing, flanges, and support systems.
b. Dimensions of major components, such as valves, cleanouts and electrical distribution equipment.

5. Electrical Work: Show the following:
   a. Runs of vertical and horizontal conduit 1-1/4 inch diameter and larger.
   b. Light fixtures.
   c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
   d. Location of pull boxes and junction boxes dimensioned from column center lines.

6. Review: Project Engineer will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Project Engineer determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Project Engineer will so inform the Contractor, who shall make changes as directed and resubmit.

7. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Division 01 Section "Submittal Procedures."

C. Coordination Digital Data Files: Prepare coordination digital data files in accordance with the following requirements:

   1. File Preparation Format: Same digital data software program, version, and operating system as the original Drawings.
   2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
      a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to the Drawings.
      b. Digital Data Software Program: The Drawings are available in AutoCAD 2012 Format.
      c. Contractor shall execute a data licensing agreement in the form of an Agreement form acceptable to the Contracting Officer and Architect.

1.6 KEY PERSONNEL

A. Key Personnel Names: Within 15 calendar days of starting construction operations, submit a list of key personnel assignments, in addition to superintendent already identified during Solicitation process, including other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in project meeting room, in temporary field offices, and by each temporary telephone. Keep list current at all times.

1.7 REQUESTS FOR INTERPRETATIONS (RFIs)

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

1. Contracting Officer will return RFIs submitted to Contracting Officer by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

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

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
   a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Form 95 "Request for Information."

D. Contracting Officer's Action: Contracting Officer will review each RFI, determine action required, and respond. RFIs received by Contracting Officer after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
e. Requests for interpretation of Contracting Officer's actions on submittals.
f. Incomplete RFIs or inaccurately prepared RFIs.

2. Contracting Officer's action may include a request for additional information, in which case Contracting Officer's time for response will date from time of receipt of additional information.

3. Contracting Officer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Claim for a Contract change according to Division 01 Section "Contract Modification Procedures" and General Provisions.

E. On receipt of Contracting Officer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Contracting Officer within seven calendar days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log [weekly]. Software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Contracting Officer's response was received.
8. Identification of related minor change in the Work, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

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

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

B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the
meeting. Advise Project Engineer and Owner’s Commissioning Authority, of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

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

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

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

C. Project Closeout Conference: Project Engineer will schedule and conduct a Project closeout conference, at a time convenient to Project Engineer and Architect, but no later than 90 calendar days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.

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

a. Preparation of record documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for preparing sustainable design documentation.
e. Requirements for preparing operations and maintenance data.
f. Requirements for demonstration and training.
g. Preparation of Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Coordination of separate contracts.
k. Owner's partial occupancy requirements.
l. Installation of Owner's furniture, fixtures, and equipment.
m. Responsibility for removing temporary facilities and controls.

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

D. Progress Meetings: Project Engineer will conduct progress meetings at weekly intervals.

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

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

1) Review schedule for next period.

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

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

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

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

E. Coordination Meetings: Project Engineer will conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to Project Engineer and other representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

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

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

b. Schedule Updating: Revise combined Contractor’s construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Start-up construction schedule.
2. Contractor's construction schedule.
3. Daily construction reports.
4. Material location reports.
5. Special reports.

B. Related Sections:

1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
2. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Contracting Officer.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.
D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.
   1. Float time belongs to Owner.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. PDF electronic file.
   2. Two paper copies.

B. Start-up construction schedule.
   1. Approval of cost-loaded start-up construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Start-up Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
   1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
   1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
   2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
   3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor’s total earnings from commencement of the Work until most recent Application for Payment.

F. Daily Construction Reports: Submit at weekly intervals.

G. Material Location Reports: Submit at monthly intervals.

H. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section “Project Management and Coordination.” Review methods and procedures related to the preliminary construction schedule and Contractor’s construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, interim milestones and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
PART 2 - PRODUCTS

2.1 CONTRACTOR’S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 30 calendar days, unless specifically allowed by Contracting Officer.
2. Mobilization/Demobilization: Include not less than 15 calendar days for mobilization, including obtaining access to the site, and not less than 10 calendar days for demobilization.
3. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 calendar days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, inspection, and delivery.
4. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor’s construction schedule with submittal schedule.
5. Testing and Inspecting: Include not less than 15 calendar days for major testing and inspecting activities.
6. Startup and Testing Time: Include not less than 15 calendar days for startup and testing.
7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Project Engineer’s administrative procedures necessary for certification of Substantial Completion.
8. Punch List and Final Completion: Include not more than 30 calendar days for punch list and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
3. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. uninterruptible services.
   d. Partial occupancy before Substantial Completion.
e. Use of premises restrictions.
f. Seasonal variations.
g. Environmental control.

4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.
b. Submittals.
c. Purchases.
d. Fabrication.
e. Sample testing.
f. Deliveries.
g. Installation.
h. Tests and inspections.
i. Adjusting.
j. Curing.
k. Startup and placement into final use and operation.

5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Structural completion.
b. Completion of mechanical installation.
c. Completion of electrical installation.
d. Completion of track installation.
e. Completion of signal work installation.
f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, milestones from Project Engineer, Substantial Completion, and final completion.

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

1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered RFIs.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar
days behind the current approved schedule, submit a separate recovery schedule
indicating means by which Contractor intends to regain compliance with the schedule.
Indicate changes to working hours, working days, crew sizes, and equipment required
to achieve compliance; and a date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program
that has been developed specifically to manage construction schedules.

1. Utilize Primavera, for the Windows 7 operating system.

2.2 START-UP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit start-up horizontal bar-chart-type construction schedule to
Contracting Officer within 30 calendar days after the Notice of Award. Start-up
schedule must be approved by Contracting Officer before Notice to Proceed will be
issued.

B. Preparation: Indicate each significant construction activity separately. Identify first
workday of each week with a continuous vertical line. Outline significant construction
activities, restraints, submittals, including durations, start dates, and finish dates for
period of 30 calendar days after Notice to Proceed. Include skeleton diagram for the
remainder of the Work and a cash requirement prediction based on indicated activities.

C. Start-up schedule will be in effect only until Contracting Officer's approval of
Contractor's construction schedule.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Base schedule on the start-up construction schedule and
additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first
workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete,
indicate an estimated completion percentage in 10 percent increments within
time bar.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Start-up Network Diagram: Outline significant construction activities for the first 90
calendar days of construction. Include skeleton diagram for the remainder of the Work
and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM
network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 15 calendar days after date established for commencement of the Work.

   a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Contracting Officer's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.

3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the start-up network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

   a. Preparation and processing of submittals.
   b. Mobilization and demobilization.
   c. Purchase of materials.
   d. Delivery.
   e. Fabrication.
   f. Utility interruptions.
   g. Installation.
   h. Work by Owner that may affect or be affected by Contractor's activities.
   i. Testing.
   j. Punch list and final completion.
   k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Show dummy activities and constraints to establish logical and complete relationships between interrelating activities.

4. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

5. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

6. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Contracting Officer's approval prior to assigning costs to fabrication and delivery activities. For unit priced or total priced contracts, indirect charges for general and administrative expenses shall be distributed over all activities. Assign costs under principal subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.

a. Each activity cost shall reflect an appropriate value subject to approval by Contracting Officer.
b. Include man-hours, unit duration, and value added including all materials purchased and equipment used.
c. Total cost assigned to activities shall equal the total Contract Sum.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities and include a brief description. Include a legend for abbreviations. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
5. Changes in the critical path.
6. Changes in total float or slack time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
   a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
   b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report, submitted to Project Engineer, recording the following information concerning events at Project site:

1. Shift start and end times.
2. List of subcontractors at Project site.
3. List of separate contractors at Project site.
4. Approximate count of personnel in each trade classification at Project site.
5. Equipment at Project site.
7. Quantities of materials installed.
8. Equipment and materials used.
9. High and low temperatures and general weather conditions, including presence of rain or snow.
10. Accidents.
11. Meetings and significant decisions.
12. Unusual events (refer to special reports).
13. Stoppages, delays, shortages, and losses.
14. Meter readings and similar recordings.
15. Emergency procedures.
16. Orders and requests of authorities having jurisdiction.
17. Change Orders received and implemented.
18. Written or oral orders received and implemented.
19. Services connected and disconnected.
20. Equipment or system tests and startups.
21. Partial completions and occupancies.
22. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
C. Daily reports and material location reports do not substitute for the notices, time slips, or other data required related to compensation for Change Orders.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Project Engineer within one calendar day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Project Engineer in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Project Engineer, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200
SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

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

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

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Project Engineer and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 calendar days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
   a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:
   a. Scheduled date for first submittal.
   b. Specification Section number and title.
   c. Submittal category: Action, informational.
   d. Name of subcontractor.
   e. Description of the Work covered.
   f. Scheduled date for Project Engineer's final release or approval.
   g. Scheduled dates for purchasing.
   h. Scheduled dates for installation.
   i. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

   a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
   c. Contractor shall execute a data licensing agreement in the form of an Agreement form acceptable to the Owner and Architect.
   d. The following plot files will be furnished for each appropriate discipline:
1) Floor plans.

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

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

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

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

1. Initial Review: Allow 21 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Project Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 21 calendar days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 calendar days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Project Engineer, Architect and to Architect's consultants, allow 21 calendar days for review of each submittal. Submittal will be returned to Project Engineer before being returned to Contractor.

D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Project Engineer.
3. Include the following information for processing and recording action taken:

a. Project name and number.
b. Date and revision date.
c. Name of Architect.
d. Name of Project Engineer.
e. Name of Contractor.
f. Name of subcontractor.
g. Name of supplier.
h. Name of manufacturer.
i. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

j. Number and title of appropriate Specification Section.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Other necessary identification.

E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Project Engineer.
4. Include the following information on an inserted cover sheet:
   a. Project name and number.
   b. Date and revision date.
   c. Name and address of Architect.
   d. Name of Project Engineer.
   e. Name of Contractor.
   f. Name of firm or entity that prepared submittal.
   g. Name of subcontractor.
   h. Name of supplier.
   i. Name of manufacturer.
   j. Number and title of appropriate Specification Section.
   k. Drawing number and detail references, as appropriate.
   l. Location(s) where product is to be installed, as appropriate.
   m. Related physical samples submitted directly.
   n. Other necessary identification.
5. Include the following information as keywords in the electronic file metadata:
   a. Project name and number.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

F. Options: Identify options requiring selection by the Project Engineer.

G. Deviations: Identify deviations from the Contract Documents on submittals.

H. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Project Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
   1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Project Engineer.

I. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Project Engineer will return submittals, without review, received from sources other than Contractor.
   2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Project Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal. Make resubmittals within 7 calendar days after receipt of Project Engineer's review comments.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision.
   3. Resubmit submittals until they are marked with approval notation from Project Engineer's action stamp.

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

L. Use for Construction: Use only final submittals that are marked with approval notation from Project Engineer's action stamp.
PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Post electronic submittals as PDF electronic files directly to Architect's FTP site specifically established for Project.
   a. Project Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Submit electronic submittals via email as PDF electronic files.
   a. Project Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

3. Action Submittals: Submit six (6) paper copies of each submittal, unless otherwise indicated. Project Engineer will return two copies.

4. Informational Submittals: Submit four (4) paper copies of each submittal, unless otherwise indicated. Project Engineer will not return copies.

5. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

6. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

7. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

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

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.

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

4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
   a. PDF electronic file.
   b. Six (6) paper copies of Product Data, unless otherwise indicated. Project Engineer will return two copies.

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

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 22 by 34 inches.
3. Submit Shop Drawings in the following format:
   a. PDF electronic file.
   b. Six (6) bond paper copies of Shop Drawings, unless otherwise indicated. Project Engineer will return two copies.

4. Final Shop Drawings: Submit six (6) bond paper copies to Project Engineer within 10 calendar days after receipt of Project Engineer's conformance designation. All copies shall be marked "This drawing was reviewed by the Project Engineer on ____________ (DATE)." Submit PDF electronic file scan or conversion of each final shop drawing.
D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Project Engineer will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit three sets of Samples. Project Engineer will retain all three Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project record sample.

   1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

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

1. Type of product. Include unique identifier for each product indicated in the Contract Documents.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:

   a. PDF electronic file.
   b. Three paper copies of product schedule or list, unless otherwise indicated. Project Engineer will return two copies.

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures" and General Provisions.

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Submit subcontract list in the following format:

   a. PDF electronic file.
   b. Number of Copies: Three paper copies of subcontractor list, unless otherwise indicated. Project Engineer will return two copies.

J. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

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

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

T. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests
performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

W. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Project Engineer.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally-signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Project Engineer.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."
C. Approval Stamp: Stamp each submittal with a uniform, approval stamp, initialed or signed by Contractor. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, field measurements verified, and approved for compliance with the Contract Documents.

3.2 PROJECT ENGINEER'S ACTION

A. General: Project Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Project Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Project Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

C. Informational Submittals: Project Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Project Engineer will forward each submittal to appropriate party.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Project Engineer.

E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300
SECTION 013513.23 - SPECIAL PROCEDURES FOR RAILROAD FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Work on or near railroad property.
2. Operations over railroad right-of-way.
3. Work on or near existing railroad tracks.
4. Equipment near or adjacent railroad tracks.
5. Railroad safety.
6. Track monitoring.
7. Watchmen's services.
8. Repair of damage to railroad facilities.

1.3 DEFINITIONS

A. Railroad: Controller of railroad tracks, facilities, or property referenced in this Section. Railroad may or may not be the Owner. However, Contractor shall contact Owner for RFIs, requests, and coordination with Railroad.

1.4 SUBMITTALS

A. Request to Access Railroad Property: At least 21 calendar days in advance of Contractor's intent to commence Work and enter upon Railroad property, submit request to the Project Engineer. The Railroad will respond to the request within 7 calendar days of receipt of the request.

B. Site-Specific Work Plan: Submit site-specific work plans including computations and a detailed description of proposed methods for accomplishing the Work, including methods for protecting Railroad traffic.

1. Approval of Site-Specific Work Plan shall not relieve Contractor of complete responsibility for the adequacy and safety of operations.

C. Crane/Hoisting Work Plan: Submit a site-specific work plan for accomplishing hoisting operations, for each type of lift.
1. Show adherence to all safety rules.
2. Show constructability.
3. Show minimal impact to rail operations.
4. Revise and resubmit plans and calculations as many times as necessary, until a complete and correct Crane/Hoisting Work Plan has been approved.
5. The approved plan will provide the basis for field inspection/verification of the actual work.

D. Request for Track Occupancy: In a form acceptable to Project Engineer.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 WORK ON OR NEAR RAILROAD PROPERTY

A. Access and Entry: The Railroad will provide access to property that is under its control by ownership or easement. Before entry onto Railroad property, a meeting will be held at which time the Contractor shall submit site-specific work plan. Access to property other than that which the Railroad provides shall be the responsibility of the Contractor. This shall include temporary access for construction beyond those limits shown.

B. Railroad Traffic: During the Work, Railroad traffic shall be maintained at all times with safety and without interruption, except when interruption is approved in advance and in writing by the Project Engineer. The date, time, and duration of all such interruptions shall be determined by the Project Engineer. Conduct operations in compliance with all rules, regulations, and requirements of the Railroad (including these Specifications) with respect to any work performed on, over, under, within or adjacent to the Railroad's property. Contractors shall be responsible for acquainting themselves with such rules, regulations and requirements. Any violation of Railroads safety rules, regulations, or requirements shall be grounds for the immediate suspension of the Work, and the re-training of all personnel, at the Contractor's expense.

C. Coordination: For all work that will be performed on or beneath Railroad property, the coordination and communication between the Contractor and the Railroad necessary to accomplish the Work will be established and maintained only through the Project Engineer.

D. Protection: The Railroad will furnish such qualified watchmen or signalmen as may be required to ensure complete protection of train operations and railroad facilities. The need for this type of service will be determined by the Project Engineer on the basis of railroad regulations and the Contractor's requirements. No work shall proceed without proper protection on the site. All expenses incurred in connection with such protection of Railroad facilities by Railroad employees will be borne by the Railroad, except for those costs associated with delays attributable to the Contractor.

E. Maintenance of Safe Conditions: If railroad tracks or other property of the Railroad are endangered during the work, Contractor shall immediately take such steps as may be
directed by the Railroad to restore safe conditions, and upon failure of Contractor to immediately carry out such direction, the Railroad may take whatever steps are reasonably necessary to restore safe conditions. All costs and expenses of restoring safe conditions, and of repairing any damage to Railroad's trains, tracks, right-of-way or other property caused by the operations of Contractor, shall be paid by the Contractor.

F. Track Fouling:

1. Track fouling is defined as the temporary placement of any material or equipment closer than fifteen (15) feet horizontally from the centerline of the nearest track. The Contractor shall schedule all work to be performed in such a manner as not to interfere with or delay railroad operations. Track fouling will be permitted with the specific case-by-case permission of the Railroad when it will not cause interference with train operations.

2. Track occupancy is defined as the exclusive use, by the Contractor, of a track within specified distance and time limits. When occupying a track, the Contractor's equipment must always remain within the clearance envelope as shown on Clearance Limitations of Roadway Work Equipment Travel & Working Dimensions on the side adjacent to active tracks. Work that requires a catenary power outage shall be considered a track occupancy.

3. The Contractor's request for a track occupancy must be presented to the Railroad weekly, at least 21 calendar days in advance of the expected occupancy. The Contractor shall be permitted a track occupancy on only one track at a time. The time includes the time it takes to obtain the use of track and the time it takes to return the track to active service. For safety reasons, each of these two actions take Railroad personnel a minimum of 30 minutes to perform. No Contractor work on or near the track is permitted during these beginning and end of shift periods.

4. The Contractor's total proposed track occupancy schedule and construction methods to be used during these track occupancies must be submitted for the Railroad's review and approval within 30 days after Notice-to-Proceed. This is essential for the proper coordination of the Contractor's activities and Railroad operations.

G. No material or equipment shall be stored on Owner's property without first having obtained permission from the Project Engineer. Any such storage will be on the condition that Owner will not be liable for loss of or damage to such materials or equipment from any cause.

1. Under no circumstances shall any materials be placed or stored within twenty-five (25) feet from the centerline of an outside track, except as approved by the site specific work plan. To insure compliance with this requirement, Contractor must establish a twenty-five (25) foot line prior to the start of work by either driving stakes, taping off or erecting a temporary fence, or providing an alternate method as approved by the Project Engineer.
3.2 OPERATIONS OVER RAILROAD RIGHT-OF-WAY

A. Crane/Hoisting Work Plan: Prepare a plan for bridge erection, demolition and other crane/hoisting operations over railroad right-of-way. Work Plan shall include the following:

1. Plan view showing location(s) of cranes, operating radii, with delivery and/or disposal locations shown. Provide all necessary dimensions for locating the elements of the plan.
2. Plans and computations showing the weight of the pick.
3. Crane rating sheets, demonstrating that cranes are adequate for 150% of the calculated pick weight (the cranes shall be capable of picking 150% of the load, while maintaining normal, recommended factors of safety). The adequacy of the crane for the proposed pick shall be determined by using the manufacturer’s published crane rating chart and not the maximum crane capacity. Crane and boom nomenclature is to be indicated.
4. Calculations demonstrating that slings, shackles, lifting beams, etc. are adequate for 150% of the calculated pick weight.
5. Location plan showing obstructions, indicating that the proposed swing is possible. "Walking" of load using two cranes will not be permitted. Rather, multiple picks and repositioning of the crane may be permitted to get the load to the needed location for the final pick, if necessary.
6. Data sheet listing types and sizes of slings and other connecting equipment. Include copies of catalog cuts for specialized equipment. Detail attachment methods on the plans.
7. A complete procedure, indicating the order of lifts and any repositioning or re-hitching of the crane or cranes.
8. Temporary support of any components or intermediate stages, as may be required.
9. A time schedule of the various stages, as well as a schedule for the entire lifting process.

B. Preparation, review and approval of the Crane/Hoisting Work Plan does not relieve the Contractor from meeting other Owner requirements for adequate planning and documentation of proposed work procedures within the right-of-way of the railroad.

C. Current safety rules shall be adhered to in every respect.

3.3 WORK ON OR NEAR EXISTING RAILROAD TRACKS

A. Temporary track crossings are prohibited.

B. Protection of Train Traffic:

1. Conduct the Work in such a manner as to safeguard train operations, tracks, facilities and property of Owner.
2. Treat all wires and attachments as live unless notified by the Project Engineer that same have been grounded and de-energized. Give particular attention to the use of hand lines containing metal strands which cannot be permitted when working near or above exposed live wires. Do not use metal ladders or ladders
reinforced by metal in a longitudinal direction near exposed wires. When working over wires, tools and materials not in use will be stored in a manner to prevent them from falling. Do not throw tools or materials to or from men working over the wires and men on the ground. Locate and protect all underground facilities.

3.4 EQUIPMENT NEAR OR ADJACENT TO RAILROAD TRACKS

A. All equipment and tools used in the performance of the work shall be in a safe operating condition, certified first-class condition and shall be suitable for the intended use. Select equipment to eliminate noise and air pollution. All mobile equipment shall be prominently marked with the Owner's or Contractor's name and a unique vehicle number.

B. No equipment shall be placed or put into operation near or adjacent to operating tracks without first obtaining permission of the Project Engineer. Under no circumstances shall any equipment or materials be placed or stored within twenty-five (25) feet from the centerline of an outside track, except as approved by the site specific work plan. To insure compliance with this requirement, Contractor must establish a twenty-five (25) foot line prior to the start of work by either driving stakes, tapering off or erecting a temporary fence, or providing an alternate method as approved by the Project Engineer.

C. The Contractor shall provide his own self-propelled equipment for accessing the work site. The equipment must adhere to Owner's requirements, such as clearances, exhaust emissions, safety features, and hitch connections. In particular, all such vehicles must satisfy, as a minimum, the requirements outlined in Appendix I, and the clearances as shown at the end of this Section in Clearance Limitations of Roadway Work Equipment Travel & Working Dimensions. All Contractor-furnished vehicles shall be subject to inspection, and approval, by Owner, at the beginning of the Work, and at six (6) month intervals, thereafter. Any trailer connected to a self-propelled vehicle is also subject to Owner inspection, and approval.

D. The Contractor shall provide a qualified driver for each piece of self-propelled equipment. The driver must be licensed for the type and weight of vehicle according to state and federal Department of Transportation requirements. The driver must also be proficient, at the Project Engineer's determination, in the operation of the specific vehicle. The driver must remain with the vehicle at all times while the vehicle is in operation. Contractor shall provide a list of the proposed employees who will act as the qualified drivers. Contractor shall demonstrate in writing that each proposed driver's qualifications meet the aforementioned requirements.

E. Inspections of equipment shall be pre-arranged through the Project Engineer and will be conducted at the nearest Amtrak Maintenance-of-Way Facility. After the equipment is inspected, the Contractor shall, in the most expeditious manner possible, deliver the equipment to a suitable compound within 20 miles of the yard for storage for completing the work. The equipment shall remain on Owner property or the suitable compound for the duration of the contract, except for such times it is fueled, maintained, or repaired. If the Contractor removes the equipment from Owner property and uses it on work other than described herein, it must be re-inspected before being allowed to resume work on Owner property. If the Project Engineer reasonably
believes that the equipment has been involved in any incident (accidental or intentional) that has or possibly has affected the high-rail gear, the Project Engineer will require the equipment to be re-inspected before the equipment is allowed to resume work on Owner property.

F. No equipment shall be stored on Owner's property without first having obtained permission from the Project Engineer. Any such storage will be on the condition that Owner will not be liable for loss of or damage to such equipment from any cause.

G. Responsibility for Damages: The Owner assumes no responsibility for any damages sustained or caused by the Contractor's equipment to public, private, or Railroad property, and approval of any portion of the work shall not act as a waiver of liability for any damage that may result from the Contractor's operations.

3.5 RAILROAD SAFETY

A. The Contractor, Subcontractors, and respective employees must first attend Owner's Safety Orientation Class. They are required to comply with Owner's safety requirements throughout the entire construction period. The Safety Orientation Class will be provided under the jurisdiction of the Project Engineer, who will be responsible to assure that the Contractor, Subcontractors, and respective employees have completed the Safety Orientation Class. The Safety Orientation Class is an online computer based training program that is available 24 hours per day / 7 days per week, provided at the sole expense of the Contractor and Subcontractor on a per-person basis. All participants completing this course are required to be able to read, comprehend and demonstrate in English their understanding of the materials presented, as well as all the safety instructions, briefings and warnings. All other costs encountered due to complying with the Owner's safety requirements will be at the sole expense of the Contractor and Subcontractor.

B. The Contractor shall appoint within 30 calendar days after award, but prior to starting work, a qualified person who will be designated as a Safety Representative for the Contractor.

3.6 TRACK MONITORING

A. Prior to any construction, profiles of all tracks shall be established. During construction and until completion of the Project, top of rail elevations of the tracks shall be taken daily or as directed by the Project Engineer. Survey stations shall be taken every 31'-0" and the data/information provided to and verified by the Project Engineer daily via a Microsoft Excel spreadsheet. Should settlement or heave of the tracks occur, work must stop and corrective actions taken.

B. If the settlement or heave at the midpoint of the sixty-two (62) foot chord along the same rail or the change in the cross level between any two points on the rail pairs is greater than one-half (1/2) inch, the Contractor shall immediately cease work and take immediate action to prevent further settlement or heave.
C. The Owner will make all necessary repairs to the track and track roadbed at the Contractor's expense.

3.7 WATCHMEN'S SERVICES

A. The Contractor shall not be permitted to cross any tracks or work within 25 feet of the tracks without the presence of a watchman provided by the Owner. Use of the watchman shall be requested through the Project Engineer at least 10 days prior to the date this service is required. The cost of watchman services (except that attributable to Contractor delay) will be borne by the Owner.

3.8 REPAIR OF DAMAGE TO RAILROAD FACILITIES

A. Immediately report to the Project Engineer any damage to railroad tracks, electric traction facilities, catenary towers, signal and communications facilities, and existing structures caused by the Contractor. All repairs will be made by the Owner at the Contractor's sole expense.

3.9 ATTACHMENTS

A. Clearance Limitations of Roadway Work Equipment Travel & Working Dimensions, issued by Office of Chief Engineer of Track, Amtrak.

END OF SECTION 013513.23
**NOTES:**

The solid outline represents the maximum allowable travel dimensions including spring deflection and wheel wear. This outline also provides clearance for equipment and carbody swingout of 1° per degree of curvature. This outline must be reduced for swingouts in excess of this amount.

The dashed line indicates the maximum allowable working position without fouling adjacent tracks. These dimensions are based on a minimum track center of 12'-0" and must be reduced by 1 inch for each degree of curvature, and 3.5 inches for each 1 inch of difference in super-elevation.

The horizontal dimensions below 1'-1" ATR represent the maximum static conditions of truck parts or carbody parts located directly over the trucks. All other equipment projections below 1'-1" must be constructed so that they do not swing beyond the statically prescribed limits while negotiating a 12°-30' curve.
SECTION 013543 – ENVIRONMENTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Environmental protection considerations consist of, but are not limited to, the following factors:
   1. Natural resources including air, water, and land.
   2. Solid waste disposal.
   4. Temporary erosion and sedimentation control.
   5. Control of toxic substances and hazardous materials.
   6. The presence of chemical, physical, and biological elements and agents that adversely affect and alter ecological balances.
   7. Degradation of the aesthetic use of the environment.
   8. Historical, archaeological, and cultural resources.

B. Related Sections:
   1. Division 01 Section "Construction Waste Management and Disposal."

1.3 SUBMITTALS

A. Submit a certificate that all materials and operating equipment installed as a part of this Project, the installation thereof and all equipment used in the construction, are in compliance with all applicable local laws, ordinances, regulations and permits concerning environmental pollution control and abatement.

B. Submit an alternative routing plan, if necessary, to close streets, walks, and other passageways anticipated to be closed to public access due to construction, demolition, or other related activities shall be submitted to the appropriate local authority and the Project Engineer.

1.4 GENERAL REQUIREMENTS

A. Provide and maintain environmental protection defined herein.
B. Comply with all Federal, State, and local laws, ordinances and regulations pertaining to environmental protection.

C. Ensure compliance by subcontractors with the provisions of this and various other sections of these specifications.

D. Use of equipment from which factory-installed, anti-pollution and noise control devices are removed or rendered ineffective, either intentionally or through lack of proper maintenance is prohibited.

E. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 01 Section "Summary."

1.5 PROTECTION OF NATURAL RESOURCES

A. General: It is intended that the natural resources within the project boundaries and outside the limits of permanent work performed be preserved in their existing condition or be restored to an equivalent of the existing condition, as approved by the Project Engineer, upon completion of the Work. Confine onsite construction activities to areas defined by the Drawings and Specifications.

B. Protection of Existing Waterways and Highways:

1. Do not dump debris or rubbish of any kind into or allow it to fall into waterways, onto adjacent banks, or onto highways. Take care to prevent damage and injury to personnel, vessels, and vehicles using rivers, highways, or pedestrian ways. Provide devices and maintain as required to prevent such occurrences. Promptly remove any material or items falling into a river, onto adjacent banks, or onto highways and immediately report to the Project Engineer and the jurisdictional agency.

2. Do not close streets, walks, and other passageways anticipated to be closed to public access due to construction, demolition, or other related activities until an alternative routing plan is approved.

C. Land Resources:

1. Except in areas indicated to be cleared, do not remove, cut, deface, injure, or destroy trees, shrubs, and vegetation without special permission from the Project Engineer. Do not fasten or attach ropes, cables, or guys to any existing nearby trees for anchorage.

2. The use of herbicides is not permitted unless otherwise specified.

3. Protect existing trees and vegetation to remain and that could be injured, bruised, defaced, and otherwise damaged by construction operations. Remove rocks that are displaced into uncleared areas.

4. Protect monuments, markers, and works of art prior to the start of operations.

5. Repair and restoration:
a. All trees and other landscape features scarred or damaged by the Contractor's equipment and operations shall be repaired and restored to their original condition.

6. Construction facilities:

a. The location of the Contractor's staging area, storage area and other construction buildings on public or privately owned property required temporarily in the performance of the Work, if not shown on the drawings require approval of the Project Engineer. Store equipment and materials at the job site in conformance with applicable local statutes, ordinances, regulations, and rulings of the proper jurisdictional authority. Do not store unnecessary materials or equipment on the jobsite and take care to prevent any structure from being loaded with a weight that will endanger its structural integrity or the safety of persons. Do not store materials on or encroach upon private property without the written consent of the owners of such private property.

D. Water Resources:

1. Do not permit stream crossings by fording with equipment. Remove temporary culverts or bridge structures upon completion of the project and repair the area in conformance with its original condition and as specified herein.
2. At all times, take measures to prevent oil or other hazardous substances from entering the ground, drainage areas, and local bodies of water.
3. Protection of Existing Wetlands and Watercourses:
   a. Plan, schedule, and undertake work in a manner that will ensure the protection and preservation of existing wetlands and watercourses.
   b. Undertake work in and around wetlands and water courses in a manner to prevent any impact upon health, safety, and welfare.
4. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Flood Plain Management:

1. Design and undertake work that may involve floodplains in full compliance with the National Flood Insurance Act of 1968, as amended (42 U.S.C. 4001 et seq.) and the Flood Disaster Protection Act of 1973 (P.L. 93-234, 87 Stat. 975). Executive Order 11988 (Floodplain Management) to be accommodated in all pertinent work through compliance with the DOT implementation plan as defined in FR 27148 (June 22, 1978).

F. Fish and Wildlife Resources:

1. Do not alter water flows or otherwise disturb native habitat near or adjacent to the project construction area.

G. Staging Areas:
1. Do not use in connection with this Contract, for storage, as a staging area, or as a preparation site, any cultural resource facility, building, site, or cleared area that is, as of the date of this Contract, on or eligible for listing on the National Register of Historic Places (16 U.S.C., paragraph 470a), without the prior approval of the Project Engineer.

2. For the purpose of the preceding paragraph the term "cultural resource" includes districts, sites, building, structures, and objects significant in American history, architecture, archaeology, or culture.

H. Historical and Scientific Specimens:

1. Protect and preserve intact all historic architectural features indicated on the Drawings and designated by the Project Engineer. Protect these features from damage, including, but not limited to that resulting from the elements, vandalism, and effects of excavation, demolition, removal, and construction operations. Remove reserved features in a manner to prevent damage and pack or crate in a manner to protect from damage. Mark all containers with proper identification and deliver to designated onsite areas for storage or transfer to a warehouse. Replace or repair lost or damaged designated architectural features as directed by the Project Engineer. Protect Amtrak's right of ownership with regard to all preserved items.

2. If during the course of work, artifacts or other evidence of archaeologic, historic, or scientific value are discovered or accidentally exposed, report such artifacts or evidence immediately to the Project Engineer. Halt work in the immediate area and protect the artifacts or other evidence from damage, including that resulting from the elements, vandalism, and the effects of excavation, demolition, removal, and construction operations until such time as qualified officials are able to conduct appropriate investigations. Do not proceed with work in the immediate area until authorization to proceed is obtained from the Project Engineer. Deliver any such evidence or artifacts found during construction operations or subsequent investigations required by this section into the custody of the Owner. They do not become the property of the Contractor. Any delay in the progress of the work as a result of encountering archaeologic or historic artifacts on the project is to be mitigated by the Contractor.

1.6 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Temporary Erosion and Sedimentation Control: Comply with the requirements of the State of Washington Department of Ecology Construction Stormwater General Permit, if the project disturbs more than one acre and discharges stormwater from the site into state surface water or into storm drainage systems, which discharge into state surface water. Comply also with the requirements specified in Division 31 Section "Site Clearing."

1.7 TOXIC SUBSTANCES

A. Asbestos and Hazardous Materials Procedure: In the event the Contractor, during the course of the work on the project, encounters the presence of asbestos or any materials containing asbestos, or polychlorinated biphenyls (PCBs) or any other
hazardous materials as recognized by the City of Chicago, Illinois Department of Labor and Industries, or Department of Ecology, promptly notify the Owner through the Project Engineer. Do not perform any work pertinent to the asbestos or hazardous material prior to receipt of special instructions from the Owner through the Project Engineer. Any delay in the progress of the work as a result of encountering either asbestos or hazardous materials on the project will be mitigated by the Project Engineer. Within 24 hours of this notification to the Owner through the Project Engineer of the encountering of the presence of asbestos or hazardous materials, the Contractor will meet with the Project Engineer to replan and work around the affected area. The Project Engineer will provide the special instructions without delay and upon confirmation by the local Authorities of the actions taken, authorize work to progress.

B. Comply with all applicable provisions of the National Emission Standards for Asbestos (40 CFR 61 Subpart B).

C. Comply with Illinois’ Hazardous Waste Regulations found in the Illinois Administrative Code (IAC), for the management of any PCBs, which may be encountered in excavations, assure proper marking, handling, and disposal of any PCB's in accordance with the regulations of 40 CFR 761.

1. Do not use PCB chemical substance, mixture, equipment, container, sealant, coating, or dust-control agent except in accordance with regulations of 40 CFR 761.
2. Immediately report any PCB chemical substance, mixture, equipment, container, sealant, coating or dust control agent, found stored within the project area to the Project Engineer in writing and stop work in the area.

1.8 CONTROL AND DISPOSAL OF EXCESS MATERIAL, TRASH AND DEBRIS

A. Dispose of excess excavated material that is approved by the Project Engineer as clean fill onsite if an onsite soil disposal area is approved by the Project Engineer. Small amounts of material generated by excavation for fencing may be exempted from this provision. In all cases the provisions of Paragraph 1.3 apply to the onsite disposal of excavated material. In the event that off-site disposal of excess soil/ballast is necessary:

1. Soil/ballast excavation and staging shall be managed to prevent soil erosion and soil, groundwater and stormwater pollution.
2. Soil/ballast shall be placed in roll-off bins or stockpiled on the ground on plastic sheeting or other material of sufficient integrity. Secured plastic sheeting/tarps will also be used to cover the soil/ballast.
3. Soil/ballast samples shall be collected and analyzed for all constituents of concern at a frequency that is in accordance with local and state regulations and the waste acceptance requirements of the potential disposal facilities.
4. Soil/ballast shall be characterized, profiled, manifested, transported and disposed of in accordance with all local, State, and federal regulations.
5. The soil/ballast storage area shall be maintained until the soil/ballast has been loaded into trucks for off-site disposal.
6. Soil/ballast shall not be transported off the site, until the disposal methods, profiles, and disposal facilities are approved by the Amtrak Environmental Department.
7. Upon project completion, all disposal manifests and/or bills of lading and any other requested documentation shall be provided to Amtrak.

B. Pick-up trash and place in containers. Empty containers on a regular schedule. Conduct handling and disposal to prevent contamination of the site and other areas. Do not dispose of in areas of natural vegetation and do not burn on the Right-of-Way (ROW). On completion, leave the area clean and natural looking.

C. Dispose of rubbish and debris as follows:

1. Transport all waste off the site and dispose of it in a manner that complies with State, and local requirements. Approval of the disposal site is required by the Project Engineer. Secure a permit or license prior to transporting any material off the site. Do not burn or bury waste materials on the site.

D. Waste Materials: No waste or erosion materials shall be allowed to enter natural or manmade water courses. Erosion materials from excavations and borrow areas shall be contained within the affected work area. The Contractor shall develop methods for controlling waste and erosion.

E. Burning: No burning of waste will be allowed.

1.9 CONTROL AND DISPOSAL OF CHEMICAL AND SANITARY WASTES

A. Dispose of sewage through connection to municipal sanitary sewage systems. Where such systems are not available, use chemical toilets or comparably effective units with wastes periodically emptied. Include provisions for pest control and for masking or elimination of odors.

1. Maintaining Sewers and Drains: The Contractor shall provide for and maintain the flow in all sewers, drains, house or inlet connections, and all water courses that may be encountered during progress of the work, at no cost to the Owner. Unless otherwise directed, the Contractor shall not allow the contents of any sewer, drain, house, or inlet connection to flow into trenches. The Contractor shall immediately remove from the proximity of the work all offensive matter, using such means as may be required at no cost to the Owner.

B. Store chemical waste in corrosion-resistant containers, remove from the project site, and dispose of as necessary, but not less frequently than monthly. Provide for disposal of chemical waste in accordance with standard established practices as approved by the Project Engineer. Conduct fueling and lubricating of equipment and motor vehicles onsite in a manner that affords the maximum protection against spills and evaporation. Dispose of lubricants to be discarded, including burned oil, in accordance with approved procedures meeting state, and local regulations. For oil and hazardous material spills that may be large enough to violate state, and local regulations, notify immediately the Project Engineer.

1.10 DUST CONTROL
A. Keep dust down at all times including nonworking hours, weekends, and holidays. Treat soil at the site, haul roads, and other areas disturbed by the Contractor's operations and materials stockpiled for the project with dust suppressers or cover to control dust. Dry power brooming will not be permitted. Use vacuuming, wet mopping, wet sweeping, or wet power brooming instead. Air blowing permitted only for cleaning off nonparticle debris, such as that from reinforcing bars. Sandblasting permitted only as specified. Only wet cutting of concrete block, concrete, and asphalt will be permitted.

B. Inspect all vehicles for dirt prior to their leaving the construction site. Remove dirt, soil, and rubble likely to be dislodged from the vehicles tires during transit from the trucks.

C. Material Transport: Trucks leaving the site and entering paved public streets shall be cleaned of mud and dirt clinging to the vehicle body and wheels. Trucks arriving at and leaving the site with materials shall be covered to prevent the dropping of materials or debris on streets. The Contractor shall maintain a suitable vehicle-cleaning and inspection facility with a permanent crew for this purpose. Spills of materials in public areas shall be removed immediately at no additional cost to the Owner.

D. Secure and cover transport equipment and loose materials in transit to ensure that materials do not become airborne during transit.

1.11 CONSTRUCTION NOISE AND VIBRATION CONTROL

A. Noise Control: The Contractor shall take every action possible to minimize the noise caused by its operation. Conduct all operations in compliance with the latest requirements of the local municipalities Noise Control Code for maximum noise levels due to construction work. Noise producing work shall be performed in less sensitive hours of the day or week as directed by Project Engineer or local ordinance.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013543
SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

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

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Project Engineer, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:

1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.

2. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Project Engineer.
C. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Project Engineer for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Project Engineer for a decision before proceeding.
1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Contractor's Quality-Control Manager Qualifications: For supervisory personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.

1. Seismic-force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by the Architect.
2. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Comply with requirements in General Provisions. Submit in format acceptable to Project Engineer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Contractor Quality Control (CQC) Representative shall not have other Project responsibilities.
C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: Include in quality-control plan a comprehensive schedule of work requiring testing or inspection, including the following:
   1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
   2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
   3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Project Engineer has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 CONTRACTORS SAFETY AND FIRE PROTECTION PROGRAM

A. Within 14 calendar days after the award of the Contract, Contractor shall submit to Project Engineer the Contractor’s Safety and Fire Protection Program. This Program shall comply with all applicable Federal, State, and local laws and Owner requirements and shall include the designation by the Contractor of an OSHA-certified individual to administer the Program.

B. Clothing and Personal Protective Equipment (PPE):
   1. Clothing must fit well and not be loose so that it would be easily snagged or become a hazard.
   2. Normal PPE for working on Owner property will be a hard hat, reflective vest, safety glasses and proper footwear and must be used as appropriate for the work being done.
   3. Other PPE requirements such as goggles, face shields, safety belts, safety harnesses, respirators and hearing protection will be determined by the Site Specific Safety Work Plan.
   4. Shoes must be at least six inches high, preferably leather and completely laced, buckled, zipped or otherwise fastened. Shoes must have a definite heel. Shoelaces shall not be loose and/or dangle far enough to become a hazard.
5. Shoes with loose, thin, cracked, rippled or wedged-type soles are not acceptable. Shoes with a metal plate or cleat on the sole or heal are not acceptable. Sandals, open toe, canvas or athletic-type shoes are not acceptable. Shoes that cannot be fastened are not acceptable. Specific footwear requirements may be addressed in the Site Specific Safety Work Plan.

6. Contractor and workers will not be permitted on Owner property if not utilizing the proper PPE.

1.8 SOURCE OF MATERIAL

A. In addition to any requirements for submittals, Contractor shall submit to Project Engineer a list of the sources from which all materials incorporated in the Work will be obtained. Make such notifications as soon as possible after award of the Contract but not later than 30 calendar days prior to any required acceptance testing.

B. In general, materials, where applicable, shall be obtained from sources approved by the State of Illinois. Obtain approval from Project Engineer for all other material sources.

1.9 REPORTS AND DOCUMENTS

A. Submit reports within five (5) calendar days after completion of testing or inspecting, or sooner if required by Project Engineer.

B. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

C. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

D. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

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

F. Required certificates of inspection, testing or approval shall be secured by the Contractor and promptly delivered to the Project Engineer.

1. Project Engineer reserves the right to refuse to permit the use of certain material on the basis of a lack of a certificate of compliance.

G. Project Engineer reserves the right to disapprove any material or equipment which previously has proven unsatisfactory in service.

1.10 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent. Professional Engineer is not the Project Engineer.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to requirements in General Provisions; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.

e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

f. When testing is complete, remove test specimens, assemblies, mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Project Engineer, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.11 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

4. Provide unrestricted access to testing and inspecting personnel at the site and during fabrication and manufacturing.

5. If work is covered up without approval of Project Engineer, uncover such work for examination by Project Engineer, where directed. After examination and approval by Project Engineer, restore removed covering as required, at no additional expense to the Owner.

6. Conduct sampling of material for testing in the presence of the Project Engineer.
7. Where quality-control services are indicated as Contractor’s responsibility, submit a certified written report, in duplicate, of each quality-control service.
8. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
9. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
10. Where field tests or instrument readings are made by Contractor's personnel, the qualifications of such personnel will at all times be subject to Project Engineer's approval.
11. All gauges and other instruments shall be in good working condition, properly calibrated to the standards of the U.S. National Bureau of Standards, and as approved by Project Engineer.
12. Results of all field tests and instrument readings shall be given to Project Engineer as soon as available, and shall be assembled and recorded in reports to be submitted to Project Engineer, in a form to be approved by Project Engineer.
13. By advance discussion with Project Engineer, Contractor shall determine the time required to perform the test and to issue each of the findings. Provide for the required time in the Contractor's construction schedule.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Project Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Project Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.
7. When the testing agency is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra costs for testing attributable to the delay shall be borne by the Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of the Contractor’s quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Project Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Project Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Project Engineer with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Project Engineer.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Project Engineer's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000
SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Project Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Project Engineer's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Project Engineer. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Name</th>
<th>Telephone</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Aluminum Association, Inc. (The)</td>
<td>(703) 358-2960</td>
<td><a href="http://www.aluminum.org">www.aluminum.org</a></td>
</tr>
<tr>
<td>AAADM</td>
<td>American Association of Automatic Door Manufacturers</td>
<td>(216) 241-7333</td>
<td><a href="http://www.aaadm.com">www.aaadm.com</a></td>
</tr>
<tr>
<td>AABC</td>
<td>Associated Air Balance Council</td>
<td>(202) 737-0202</td>
<td><a href="http://www.aabchq.com">www.aabchq.com</a></td>
</tr>
<tr>
<td>AAMA</td>
<td>American Architectural Manufacturers Association</td>
<td>(847) 303-5664</td>
<td><a href="http://www.aamanet.org">www.aamanet.org</a></td>
</tr>
<tr>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
<td>(202) 624-5800</td>
<td><a href="http://www.transportation.org">www.transportation.org</a></td>
</tr>
<tr>
<td>AATCC</td>
<td>American Association of Textile Chemists and Colorists</td>
<td>(919) 549-8141</td>
<td><a href="http://www.aatcc.org">www.aatcc.org</a></td>
</tr>
<tr>
<td>ABAA</td>
<td>Air Barrier Association of America</td>
<td>(866) 956-5888</td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>Name</td>
<td>Address</td>
<td>Phone</td>
</tr>
<tr>
<td>--------------</td>
<td>------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>ABMA</td>
<td>American Bearing Manufacturers Association</td>
<td>14435.004, Chicago, IL</td>
<td>(202) 367-1155</td>
</tr>
<tr>
<td>ACI</td>
<td>American Concrete Institute</td>
<td>14435.004, Chicago, IL</td>
<td>(248) 848-3700</td>
</tr>
<tr>
<td>ACPA</td>
<td>American Concrete Pipe Association</td>
<td>14435.004, Chicago, IL</td>
<td>(972) 506-7216</td>
</tr>
<tr>
<td>AEIC</td>
<td>Association of Edison Illuminating Companies, Inc. (The)</td>
<td>14435.004, Chicago, IL</td>
<td>(205) 257-2530</td>
</tr>
<tr>
<td>AF&amp;PA</td>
<td>American Forest &amp; Paper Association</td>
<td>14435.004, Chicago, IL</td>
<td>(800) 878-8878</td>
</tr>
<tr>
<td>AGA</td>
<td>American Gas Association</td>
<td>14435.004, Chicago, IL</td>
<td>(202) 824-7000</td>
</tr>
<tr>
<td>AGC</td>
<td>Associated General Contractors of America (The)</td>
<td>14435.004, Chicago, IL</td>
<td>(703) 548-3118</td>
</tr>
<tr>
<td>AHA</td>
<td>American Hardboard Association</td>
<td>14435.004, Chicago, IL</td>
<td>(202) 872-5955</td>
</tr>
<tr>
<td>AHAM</td>
<td>Association of Home Appliance Manufacturers</td>
<td>14435.004, Chicago, IL</td>
<td>(202) 872-5955</td>
</tr>
<tr>
<td>AI</td>
<td>Asphalt Institute</td>
<td>14435.004, Chicago, IL</td>
<td>(859) 288-4960</td>
</tr>
<tr>
<td>AIA</td>
<td>American Institute of Architects (The)</td>
<td>14435.004, Chicago, IL</td>
<td>(800) 242-3837</td>
</tr>
<tr>
<td>AISC</td>
<td>American Institute of Steel Construction</td>
<td>14435.004, Chicago, IL</td>
<td>(800) 644-2400</td>
</tr>
<tr>
<td>AISI</td>
<td>American Iron and Steel Institute</td>
<td>14435.004, Chicago, IL</td>
<td>(202) 452-7100</td>
</tr>
<tr>
<td>AITC</td>
<td>American Institute of Timber Construction</td>
<td>14435.004, Chicago, IL</td>
<td>(303) 792-9559</td>
</tr>
<tr>
<td>ALCA</td>
<td>Associated Landscape Contractors of America</td>
<td>14435.004, Chicago, IL</td>
<td>(301) 972-1700</td>
</tr>
<tr>
<td>ALSC</td>
<td>American Lumber Standard Committee, Incorporated</td>
<td>14435.004, Chicago, IL</td>
<td>(847) 394-0150</td>
</tr>
<tr>
<td>AMCA</td>
<td>Air Movement and Control Association International, Inc.</td>
<td>14435.004, Chicago, IL</td>
<td>(847) 394-0150</td>
</tr>
</tbody>
</table>

REFERENCES 014200 - 3 of 19
www.amca.org

ANSI  American National Standards Institute  (202) 293-8020
  www.ansi.org

AOSA  Association of Official Seed Analysts, Inc.  (405) 780-7372
  www.aosaseed.com

APA  Architectural Precast Association  (239) 454-6989
  www.archprecast.org

APA  APA - The Engineered Wood Association  (253) 565-6600
  www.apawood.org

APA EWS  APA - The Engineered Wood Association; Engineered Wood Systems
  (See APA - The Engineered Wood Association)

API  American Petroleum Institute  (202) 682-8000
  www.api.org

ARI  Air-Conditioning & Refrigeration Institute  (703) 524-8800
  www.ari.org

ARMA  Asphalt Roofing Manufacturers Association  (202) 207-0917
  www.asphaltroofing.org

ASCE  American Society of Civil Engineers  (800) 548-2723
  (703) 295-6300
  www.asce.org

ASCE/SEI  American Society of Civil Engineers/Structural Engineering Institute
  (See ASCE)

ASHRAE  American Society of Heating, Refrigerating and Air-Conditioning Engineers
  (800) 527-4723
  (404) 636-8400
  www.ashrae.org

ASME  ASME International
  (American Society of Mechanical Engineers International)
  (800) 843-2763
  (973) 882-1170
  www.asme.org

ASSE  American Society of Sanitary Engineering
  (440) 835-3040
  www.asse-plumbing.org

ASTM  ASTM International
  (American Society for Testing and Materials International)
  (610) 832-9500
  www.astm.org

AWCI  Association of the Wall and Ceiling Industry  (703) 534-8300
  www.awci.org
<table>
<thead>
<tr>
<th>Organization</th>
<th>Description</th>
<th>Phone Numbers</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWCMA</td>
<td>American Window Covering Manufacturers Association (Now WCMA)</td>
<td>(571) 323-3636</td>
<td><a href="http://www.awinet.org">www.awinet.org</a></td>
</tr>
<tr>
<td>AWI</td>
<td>Architectural Woodwork Institute</td>
<td>(571) 323-3636</td>
<td><a href="http://www.awinet.org">www.awinet.org</a></td>
</tr>
<tr>
<td>AWPA</td>
<td>American Wood Protection Association (Formerly: American Wood Preservers' Association)</td>
<td>(205) 733-4077</td>
<td><a href="http://www.awpa.com">www.awpa.com</a></td>
</tr>
<tr>
<td>AWS</td>
<td>American Welding Society</td>
<td>(800) 443-9353 (305) 443-9353</td>
<td><a href="http://www.aws.org">www.aws.org</a></td>
</tr>
<tr>
<td>AWWA</td>
<td>American Water Works Association</td>
<td>(800) 926-7337 (303) 794-7711</td>
<td><a href="http://www.awwa.org">www.awwa.org</a></td>
</tr>
<tr>
<td>BHMA</td>
<td>Builders Hardware Manufacturers Association</td>
<td>(212) 297-2122</td>
<td><a href="http://www.buildershardware.com">www.buildershardware.com</a></td>
</tr>
<tr>
<td>BIA</td>
<td>Brick Industry Association (The)</td>
<td>(703) 620-0010</td>
<td><a href="http://www.bia.org">www.bia.org</a></td>
</tr>
<tr>
<td>BICSI</td>
<td>BICSI, Inc.</td>
<td>(800) 242-7405 (813) 979-1991</td>
<td><a href="http://www.bicsi.org">www.bicsi.org</a></td>
</tr>
<tr>
<td>BIFMA</td>
<td>BIFMA International (Business and Institutional Furniture Manufacturer's Association International)</td>
<td>(616) 285-3963</td>
<td><a href="http://www.bifma.com">www.bifma.com</a></td>
</tr>
<tr>
<td>BISSC</td>
<td>Baking Industry Sanitation Standards Committee</td>
<td>(866) 342-4772</td>
<td><a href="http://www.bissc.org">www.bissc.org</a></td>
</tr>
<tr>
<td>BWF</td>
<td>Badminton World Federation (Formerly: IBF - International Badminton Federation)</td>
<td>6-03-9283 7155</td>
<td><a href="http://www.internationalbadminton.org">www.internationalbadminton.org</a></td>
</tr>
<tr>
<td>CCC</td>
<td>Carpet Cushion Council</td>
<td>(610) 527-3880</td>
<td><a href="http://www.carpetcushion.org">www.carpetcushion.org</a></td>
</tr>
<tr>
<td>CDA</td>
<td>Copper Development Association</td>
<td>(800) 232-3282 (212) 251-7200</td>
<td><a href="http://www.copper.org">www.copper.org</a></td>
</tr>
<tr>
<td>CEA</td>
<td>Canadian Electricity Association</td>
<td>(613) 230-9263</td>
<td><a href="http://www.canelect.ca">www.canelect.ca</a></td>
</tr>
<tr>
<td>CEA</td>
<td>Consumer Electronics Association</td>
<td>(866) 858-1555 (703) 907-7600</td>
<td><a href="http://www.ce.org">www.ce.org</a></td>
</tr>
<tr>
<td>CFFA</td>
<td>Chemical Fabrics &amp; Film Association, Inc.</td>
<td>(216) 241-7333</td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>Description</td>
<td>Website</td>
<td>Phone Numbers</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>CGA</td>
<td>Compressed Gas Association</td>
<td><a href="http://www.cganet.com">www.cganet.com</a></td>
<td>(703) 788-2700</td>
</tr>
<tr>
<td>CIMA</td>
<td>Cellulose Insulation Manufacturers Association</td>
<td><a href="http://www.cellulose.org">www.cellulose.org</a></td>
<td>(888) 881-2462</td>
</tr>
<tr>
<td>CISCA</td>
<td>Ceilings &amp; Interior Systems Construction Association</td>
<td><a href="http://www.cisca.org">www.cisca.org</a></td>
<td>(630) 584-1919</td>
</tr>
<tr>
<td>CISPI</td>
<td>Cast Iron Soil Pipe Institute</td>
<td><a href="http://www.cispi.org">www.cispi.org</a></td>
<td>(423) 892-0137</td>
</tr>
<tr>
<td>CLFMI</td>
<td>Chain Link Fence Manufacturers Institute</td>
<td><a href="http://www.chainlinkinfo.org">www.chainlinkinfo.org</a></td>
<td>(301) 596-2583</td>
</tr>
<tr>
<td>CRRC</td>
<td>Cool Roof Rating Council</td>
<td><a href="http://www.coolroofs.org">www.coolroofs.org</a></td>
<td>(866) 465-2523</td>
</tr>
<tr>
<td>CPA</td>
<td>Composite Panel Association</td>
<td><a href="http://www.pbmdf.com">www.pbmdf.com</a></td>
<td>(301) 670-0604</td>
</tr>
<tr>
<td>CPPA</td>
<td>Corrugated Polyethylene Pipe Association</td>
<td><a href="http://www.cppa-info.org">www.cppa-info.org</a></td>
<td>(800) 510-2772</td>
</tr>
<tr>
<td>CRI</td>
<td>Carpet and Rug Institute (The)</td>
<td><a href="http://www.carpet-rug.com">www.carpet-rug.com</a></td>
<td>(800) 882-8846</td>
</tr>
<tr>
<td>CRSI</td>
<td>Concrete Reinforcing Steel Institute</td>
<td><a href="http://www.crsi.org">www.crsi.org</a></td>
<td>(847) 517-1200</td>
</tr>
<tr>
<td>CSA</td>
<td>Canadian Standards Association</td>
<td></td>
<td>(800) 463-6727</td>
</tr>
<tr>
<td>CSA</td>
<td>CSA International (Formerly: IAS - International Approval Services)</td>
<td></td>
<td>(866) 797-4272</td>
</tr>
<tr>
<td>CSI</td>
<td>Cast Stone Institute</td>
<td><a href="http://www.caststone.org">www.caststone.org</a></td>
<td>(717) 272-3744</td>
</tr>
<tr>
<td>CSI</td>
<td>Construction Specifications Institute (The)</td>
<td><a href="http://www.csinet.org">www.csinet.org</a></td>
<td>(800) 689-2900</td>
</tr>
<tr>
<td>CSSB</td>
<td>Cedar Shake &amp; Shingle Bureau</td>
<td><a href="http://www.cedarbureau.org">www.cedarbureau.org</a></td>
<td>(604) 820-7700</td>
</tr>
<tr>
<td>CTI</td>
<td>Cooling Technology Institute</td>
<td></td>
<td>(281) 583-4087</td>
</tr>
<tr>
<td></td>
<td>(Formerly: Cooling Tower Institute)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>REFERENCES</td>
<td></td>
<td>014200 - 6 of 19</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Name</td>
<td>Contact Information</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>------</td>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td>DHI</td>
<td>Door and Hardware Institute</td>
<td><a href="http://www.dhi.org">www.dhi.org</a></td>
<td>(703) 222-2010</td>
</tr>
<tr>
<td>EIA</td>
<td>Electronic Industries Alliance</td>
<td><a href="http://www.eia.org">www.eia.org</a></td>
<td>(703) 907-7500</td>
</tr>
<tr>
<td>EIMA</td>
<td>EIFS Industry Members Association</td>
<td><a href="http://www.eima.com">www.eima.com</a></td>
<td>(800) 294-3462</td>
</tr>
<tr>
<td>EJCDC</td>
<td>Engineers Joint Contract Documents Committee</td>
<td><a href="http://www.ejdc.org">www.ejdc.org</a></td>
<td>(703) 295-5000</td>
</tr>
<tr>
<td>EJMA</td>
<td>Expansion Joint Manufacturers Association, Inc.</td>
<td><a href="http://www.ejma.org">www.ejma.org</a></td>
<td>(914) 332-0040</td>
</tr>
<tr>
<td>ESD</td>
<td>ESD Association</td>
<td><a href="http://www.esda.org">www.esda.org</a></td>
<td>(315) 339-6937</td>
</tr>
<tr>
<td>ETL SEMCO</td>
<td>Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA)</td>
<td><a href="http://www.intertek.com">www.intertek.com</a></td>
<td>(800) 967-5352</td>
</tr>
<tr>
<td>FIBA</td>
<td>Federation Internationale de Basketball (The International Basketball Federation)</td>
<td><a href="http://www.fiba.com">www.fiba.com</a></td>
<td>41 22 545 00 00</td>
</tr>
<tr>
<td>FIVB</td>
<td>Federation Internationale de Volleyball (The International Volleyball Federation)</td>
<td><a href="http://www.fivb.ch">www.fivb.ch</a></td>
<td>41 21 345 35 35</td>
</tr>
<tr>
<td>FM Approvals</td>
<td>FM Approvals LLC</td>
<td><a href="http://www.fmglobal.com">www.fmglobal.com</a></td>
<td>(781) 762-4300</td>
</tr>
<tr>
<td>FM Global</td>
<td>FM Global (Formerly: FMG - FM Global)</td>
<td><a href="http://www.fmglobal.com">www.fmglobal.com</a></td>
<td>(401) 275-3000</td>
</tr>
<tr>
<td>FMRC</td>
<td>Factory Mutual Research (Now FM Global)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRSA</td>
<td>Florida Roofing, Sheet Metal &amp; Air Conditioning Contractors Association, Inc.</td>
<td><a href="http://www.floridaroof.com">www.floridaroof.com</a></td>
<td>(407) 671-3772</td>
</tr>
<tr>
<td>FSA</td>
<td>Fluid Sealing Association</td>
<td><a href="http://www.fluidsealing.com">www.fluidsealing.com</a></td>
<td>(610) 971-4850</td>
</tr>
<tr>
<td>FSC</td>
<td>Forest Stewardship Council</td>
<td><a href="http://www.fsc.org">www.fsc.org</a></td>
<td>49 228 367 66 0</td>
</tr>
</tbody>
</table>
GA  Gypsum Association
    www.gypsum.org  (202) 289-5440

GANA  Glass Association of North America
    www.glasswebsite.com  (785) 271-0208

GRI  (Part of GSI)

GS  Green Seal
    www.greenseal.org  (202) 872-6400

GSI  Geosynthetic Institute
    www.geosynthetic-institute.org  (610) 522-8440

HI  Hydraulic Institute
    www.pumps.org  (973) 267-9700

HI  Hydronics Institute
    www.gamanet.org  (908) 464-8200

HMMA  Hollow Metal Manufacturers Association
(Part of NAAMM)

HPVA  Hardwood Plywood & Veneer Association
    www.hpva.org  (703) 435-2900

HPW  H. P. White Laboratory, Inc.
    www.hpwhite.com  (410) 838-6550

IAS  International Approval Services
(Now CSA International)

IBF  International Badminton Federation
(Now BWF)

ICEA  Insulated Cable Engineers Association, Inc.
    www.icea.net  (770) 830-0369

ICRI  International Concrete Repair Institute, Inc.
    www.icri.org  (847) 827-0830

IEC  International Electrotechnical Commission
    www.iec.ch

IEEE  Institute of Electrical and Electronics Engineers, Inc. (The)
    www.ieee.org  (212) 419-7900

IESNA  Illuminating Engineering Society of North America
    www.iesna.org  (212) 248-5000
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEST</td>
<td>Institute of Environmental Sciences and Technology</td>
<td>(847) 255-1561</td>
</tr>
<tr>
<td>IGCC</td>
<td>Insulating Glass Certification Council</td>
<td>(315) 646-2234</td>
</tr>
<tr>
<td>IGMA</td>
<td>Insulating Glass Manufacturers Alliance</td>
<td>(613) 233-1510</td>
</tr>
<tr>
<td>ILI</td>
<td>Indiana Limestone Institute of America, Inc.</td>
<td>(812) 275-4426</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
<td>41 22 749 01 11</td>
</tr>
<tr>
<td></td>
<td>Available from ANSI</td>
<td>(202) 293-8020</td>
</tr>
<tr>
<td>ISSFA</td>
<td>International Solid Surface Fabricators Association</td>
<td>(877) 464-7732</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(702) 567-8150</td>
</tr>
<tr>
<td>ITS</td>
<td>Intertek Testing Service NA</td>
<td></td>
</tr>
<tr>
<td>ITU</td>
<td>International Telecommunication Union</td>
<td>41 22 730 51 11</td>
</tr>
<tr>
<td>KCMA</td>
<td>Kitchen Cabinet Manufacturers Association</td>
<td>(703) 264-1690</td>
</tr>
<tr>
<td>LMA</td>
<td>Laminating Materials Association</td>
<td>(Now part of CPA)</td>
</tr>
<tr>
<td>LPI</td>
<td>Lightning Protection Institute</td>
<td>(800) 488-6864</td>
</tr>
<tr>
<td>MBMA</td>
<td>Metal Building Manufacturers Association</td>
<td>(216) 241-7333</td>
</tr>
<tr>
<td>MFMA</td>
<td>Maple Flooring Manufacturers Association, Inc.</td>
<td>(888) 480-9138</td>
</tr>
<tr>
<td>MFMA</td>
<td>Metal Framing Manufacturers Association, Inc.</td>
<td>(312) 644-6610</td>
</tr>
<tr>
<td>MH</td>
<td>Material Handling</td>
<td>(Now MHIA)</td>
</tr>
<tr>
<td>MHIA</td>
<td>Material Handling Industry of America</td>
<td>(800) 345-1815</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(704) 676-1190</td>
</tr>
</tbody>
</table>
MIA  Marble Institute of America
www.marble-institute.com
(440) 250-9222

MPI  Master Painters Institute
www.paintinfo.com
(888) 674-8937
(604) 298-7578

MSS  Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
www.mss-hq.com
(703) 281-6613

NAAMM  National Association of Architectural Metal Manufacturers
www.naamm.org
(630) 942-6591

NACE  NACE International
(National Association of Corrosion Engineers International)
www.nace.org
(800) 797-6623
(281) 228-6200

NADCA  National Air Duct Cleaners Association
www.nadca.com
(202) 737-2926

NAGWS  National Association for Girls and Women in Sport
www.aahperd.org/nagws/
(800) 213-7193, ext. 453

NAIMA  North American Insulation Manufacturers Association
www.naima.org
(703) 684-0084

NBGQA  National Building Granite Quarries Association, Inc.
www.nbgqa.com
(800) 557-2848

NCAA  National Collegiate Athletic Association (The)
www.ncaa.org
(317) 917-6222

NCMA  National Concrete Masonry Association
www.ncma.org
(703) 713-1900

NCPI  National Clay Pipe Institute
www.ncpi.org
(262) 248-9094

NCTA  National Cable & Telecommunications Association
www.ncta.com
(202) 775-2300

NEBB  National Environmental Balancing Bureau
www.nebb.org
(301) 977-3698

NECA  National Electrical Contractors Association
www.necanet.org
(301) 657-3110

NeLMA  Northeastern Lumber Manufacturers' Association
www.nelma.org
(207) 829-6901
<table>
<thead>
<tr>
<th>Organization</th>
<th>Description</th>
<th>Phone</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEMA</td>
<td>National Electrical Manufacturers Association</td>
<td>(703) 841-3200</td>
<td><a href="http://www.nema.org">www.nema.org</a></td>
</tr>
<tr>
<td>NETA</td>
<td>InterNational Electrical Testing Association</td>
<td>(888) 300-6382</td>
<td><a href="http://www.netaworld.org">www.netaworld.org</a></td>
</tr>
<tr>
<td>NFHS</td>
<td>National Federation of State High School Associations</td>
<td>(317) 972-6900</td>
<td><a href="http://www.nfhs.org">www.nfhs.org</a></td>
</tr>
<tr>
<td>NFPA</td>
<td>NFPA (National Fire Protection Association)</td>
<td>(800) 344-3555</td>
<td><a href="http://www.nfpa.org">www.nfpa.org</a></td>
</tr>
<tr>
<td>NFRC</td>
<td>National Fenestration Rating Council</td>
<td>(301) 589-1776</td>
<td><a href="http://www.nfrc.org">www.nfrc.org</a></td>
</tr>
<tr>
<td>NGA</td>
<td>National Glass Association</td>
<td>(866) 342-5642</td>
<td><a href="http://www.glass.org">www.glass.org</a></td>
</tr>
<tr>
<td>NHLA</td>
<td>National Hardwood Lumber Association</td>
<td>(800) 933-0318</td>
<td><a href="http://www.natlhardwood.org">www.natlhardwood.org</a></td>
</tr>
<tr>
<td>NLGA</td>
<td>National Lumber Grades Authority</td>
<td>(604) 524-2393</td>
<td><a href="http://www.nlga.org">www.nlga.org</a></td>
</tr>
<tr>
<td>OFMA</td>
<td>NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)</td>
<td>(901) 526-5016</td>
<td><a href="http://www.nofma.com">www.nofma.com</a></td>
</tr>
<tr>
<td>NOMMA</td>
<td>National Ornamental &amp; Miscellaneous Metals Association</td>
<td>(888) 516-8585</td>
<td><a href="http://www.nomma.org">www.nomma.org</a></td>
</tr>
<tr>
<td>NRCA</td>
<td>National Roofing Contractors Association</td>
<td>(800) 323-9545</td>
<td><a href="http://www.nrca.net">www.nrca.net</a></td>
</tr>
<tr>
<td>NRMCA</td>
<td>National Ready Mixed Concrete Association</td>
<td>(888) 846-7622</td>
<td><a href="http://www.nrmca.org">www.nrmca.org</a></td>
</tr>
<tr>
<td>NSF</td>
<td>NSF International (National Sanitation Foundation International)</td>
<td>(800) 673-6275</td>
<td><a href="http://www.nsf.org">www.nsf.org</a></td>
</tr>
<tr>
<td>NSSGA</td>
<td>National Stone, Sand &amp; Gravel Association</td>
<td>(800) 342-1415</td>
<td><a href="http://www.nssga.org">www.nssga.org</a></td>
</tr>
<tr>
<td>NTMA</td>
<td>National Terrazzo &amp; Mosaic Association, Inc. (The)</td>
<td>(800) 323-9736</td>
<td><a href="http://www.ntma.com">www.ntma.com</a></td>
</tr>
<tr>
<td>NTRMA</td>
<td>National Tile Roofing Manufacturers Association (Now TRI)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acronym</td>
<td>Organization Name</td>
<td>Phone</td>
<td>Website</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------------</td>
<td>-------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>NWWDA</td>
<td>National Wood Window and Door Association (Now WDMA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OPL</td>
<td>Omega Point Laboratories, Inc. (Now ITS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCI</td>
<td>Precast/Prestressed Concrete Institute</td>
<td>(312) 786-0300</td>
<td><a href="http://www.pci.org">www.pci.org</a></td>
</tr>
<tr>
<td>PDCA</td>
<td>Painting &amp; Decorating Contractors of America</td>
<td>(800) 332-7322</td>
<td><a href="http://www.pdca.com">www.pdca.com</a></td>
</tr>
<tr>
<td>PDI</td>
<td>Plumbing &amp; Drainage Institute</td>
<td>(800) 589-8956</td>
<td><a href="http://www.pdionline.org">www.pdionline.org</a></td>
</tr>
<tr>
<td>PGI</td>
<td>PVC Geomembrane Institute</td>
<td>(217) 333-3929</td>
<td><a href="http://pgi-tp.ce.uiuc.edu">http://pgi-tp.ce.uiuc.edu</a></td>
</tr>
<tr>
<td>PLANET</td>
<td>Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America)</td>
<td>(800) 395-2522</td>
<td><a href="http://www.landcarenetwork.org">www.landcarenetwork.org</a></td>
</tr>
<tr>
<td>PTI</td>
<td>Post-Tensioning Institute</td>
<td>(602) 870-7540</td>
<td></td>
</tr>
<tr>
<td>RCSC</td>
<td>Research Council on Structural Connections</td>
<td></td>
<td><a href="http://www.boltcouncil.org">www.boltcouncil.org</a></td>
</tr>
<tr>
<td>RFCI</td>
<td>Resilient Floor Covering Institute</td>
<td>(301) 340-8580</td>
<td><a href="http://www.rfci.com">www.rfci.com</a></td>
</tr>
<tr>
<td>RIS</td>
<td>Redwood Inspection Service</td>
<td>(888) 225-7339</td>
<td><a href="http://www.redwoodinspection.com">www.redwoodinspection.com</a></td>
</tr>
<tr>
<td>SAE</td>
<td>SAE International</td>
<td>(877) 606-7323</td>
<td><a href="http://www.sae.org">www.sae.org</a></td>
</tr>
<tr>
<td>SDI</td>
<td>Steel Deck Institute</td>
<td>(847) 458-4647</td>
<td><a href="http://www.sdi.org">www.sdi.org</a></td>
</tr>
<tr>
<td>SDI</td>
<td>Steel Door Institute</td>
<td>(440) 899-0010</td>
<td><a href="http://www.steeldoor.org">www.steeldoor.org</a></td>
</tr>
<tr>
<td>SEFA</td>
<td>Scientific Equipment and Furniture Association</td>
<td>(877) 294-5424</td>
<td><a href="http://www.sefalabs.com">www.sefalabs.com</a></td>
</tr>
<tr>
<td>SEI/ASCE</td>
<td>Structural Engineering Institute/American Society of Civil Engineers (See ASCE)</td>
<td>(516) 294-5424</td>
<td></td>
</tr>
</tbody>
</table>

REFERENCES
SGCC  Safety Glazing Certification Council  (315) 646-2234  www.sgcc.org
SIA   Security Industry Association  (866) 817-8888  www.siaonline.org
SIGMA  Sealed Insulating Glass Manufacturers Association (Now IGMA)
SJI   Steel Joist Institute  (843) 626-1995  www.steeljoist.org
SMA   Screen Manufacturers Association  (561) 533-0991  www.smacentral.org
SMACNA  Sheet Metal and Air Conditioning Contractors' National Association  (703) 803-2980  www.smacna.org
SMPTE  Society of Motion Picture and Television Engineers  (914) 761-1100  www.smpte.org
SPFA  Spray Polyurethane Foam Alliance  (800) 523-6154  www.sprayfoam.org
SPIB  Southern Pine Inspection Bureau (The)  (850) 434-2611  www.spib.org
SPRI  Single Ply Roofing Industry  (781) 647-7026  www.spri.org
SSINA  Specialty Steel Industry of North America  (800) 982-0355  www.ssina.com
SSPC  SSPC: The Society for Protective Coatings  (877) 281-7772  www.sspc.org
(412) 281-2331
STI   Steel Tank Institute  (847) 438-8265  www.steeltank.com
SWI   Steel Window Institute  (216) 241-7333  www.steelwindows.com
SWRI  Sealant, Waterproofing, & Restoration Institute  (816) 472-7974  www.swrionline.org
TCA   Tile Council of America, Inc. (Now TCNA)
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Organization Name</th>
<th>Phone</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCNA</td>
<td>Tile Council of North America, Inc.</td>
<td>(864) 646-8453</td>
<td><a href="http://www.tileusa.com">www.tileusa.com</a></td>
</tr>
<tr>
<td>TIA/EIA</td>
<td>Telecommunications Industry Association/Electronic</td>
<td>(703) 907-7700</td>
<td>Industries Alliance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="http://www.tiaonline.org">www.tiaonline.org</a></td>
</tr>
<tr>
<td>TMS</td>
<td>The Masonry Society</td>
<td>(303) 939-9700</td>
<td><a href="http://www.masonrysociety.org">www.masonrysociety.org</a></td>
</tr>
<tr>
<td>TPI</td>
<td>Truss Plate Institute, Inc.</td>
<td>(703) 683-1010</td>
<td><a href="http://www.tpiinst.org">www.tpiinst.org</a></td>
</tr>
<tr>
<td>TPI</td>
<td>Turfgrass Producers International</td>
<td>(800) 405-8873</td>
<td><a href="http://www.turfgrassssod.org">www.turfgrassssod.org</a></td>
</tr>
<tr>
<td>TRI</td>
<td>Tile Roofing Institute</td>
<td>(312) 670-4177</td>
<td><a href="http://www.tileroofing.org">www.tileroofing.org</a></td>
</tr>
<tr>
<td>UL</td>
<td>Underwriters Laboratories Inc.</td>
<td>(877) 854-3577</td>
<td><a href="http://www.ul.com">www.ul.com</a></td>
</tr>
<tr>
<td>UNI</td>
<td>Uni-Bell PVC Pipe Association</td>
<td>(972) 243-3902</td>
<td><a href="http://www.uni-bell.org">www.uni-bell.org</a></td>
</tr>
<tr>
<td>USAV</td>
<td>USA Volleyball</td>
<td>(888) 786-5539</td>
<td><a href="http://www.usavolleyball.org">www.usavolleyball.org</a></td>
</tr>
<tr>
<td>USGBC</td>
<td>U.S. Green Building Council</td>
<td>(800) 795-1747</td>
<td><a href="http://www.usgbc.org">www.usgbc.org</a></td>
</tr>
<tr>
<td>USITT</td>
<td>United States Institute for Theatre Technology, Inc.</td>
<td>(800) 938-7488</td>
<td><a href="http://www.usitt.org">www.usitt.org</a></td>
</tr>
<tr>
<td>WASTEC</td>
<td>Waste Equipment Technology Association</td>
<td>(800) 424-2869</td>
<td><a href="http://www.wastec.org">www.wastec.org</a></td>
</tr>
<tr>
<td>WCLIB</td>
<td>West Coast Lumber Inspection Bureau</td>
<td>(800) 283-1486</td>
<td><a href="http://www.wclib.org">www.wclib.org</a></td>
</tr>
<tr>
<td>WCMA</td>
<td>Window Covering Manufacturers Association</td>
<td>(212) 297-2122</td>
<td><a href="http://www.wcmanet.org">www.wcmanet.org</a></td>
</tr>
<tr>
<td>WCSC</td>
<td>Window Covering Safety Council</td>
<td>(800) 506-4636</td>
<td>(Formerly: WCMA - Window</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Covering Manufacturers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Association)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="http://www.windowcoverings.org">www.windowcoverings.org</a></td>
</tr>
<tr>
<td>WDMA</td>
<td>Window &amp; Door Manufacturers Association</td>
<td>(800) 223-2301</td>
<td>(Formerly: NWWDA - National Window and Door</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(847) 299-5200</td>
</tr>
</tbody>
</table>
C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

IAPMO International Association of Plumbing and Mechanical Officials (909) 472-4100
www.iapmo.org

ICC International Code Council (888) 422-7233
www.iccsafe.org

ICC-ES ICC Evaluation Service, Inc. (800) 423-6587
www.icc-es.org (562) 699-0543

UBC Uniform Building Code (See ICC)

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE Army Corps of Engineers (202) 761-0011
www.usace.army.mil

CPSC Consumer Product Safety Commission (800) 638-2772 (301) 504-7923
www.cpsc.gov

DOC Department of Commerce (202) 482-2000
www.commerce.gov
<table>
<thead>
<tr>
<th>Agency</th>
<th>Name</th>
<th>Phone</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOE</td>
<td>Department of Energy</td>
<td>(202) 586-9220</td>
<td><a href="http://www.energy.gov">www.energy.gov</a></td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
<td>(202) 272-0167</td>
<td><a href="http://www.epa.gov">www.epa.gov</a></td>
</tr>
<tr>
<td>FAA</td>
<td>Federal Aviation Administration</td>
<td>(866) 835-5322</td>
<td><a href="http://www.faa.gov">www.faa.gov</a></td>
</tr>
<tr>
<td>FDA</td>
<td>Food and Drug Administration</td>
<td>(888) 463-6332</td>
<td><a href="http://www.fda.gov">www.fda.gov</a></td>
</tr>
<tr>
<td>GSA</td>
<td>General Services Administration</td>
<td>(800) 488-3111</td>
<td><a href="http://www.gsa.gov">www.gsa.gov</a></td>
</tr>
<tr>
<td>LBL</td>
<td>Lawrence Berkeley National Laboratory</td>
<td>(510) 486-4000</td>
<td><a href="http://www.lbl.gov">www.lbl.gov</a></td>
</tr>
<tr>
<td>NCHR</td>
<td>National Cooperative Highway Research Program</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(See TRB)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIST</td>
<td>National Institute of Standards and Technology</td>
<td>(301) 975-6478</td>
<td><a href="http://www.nist.gov">www.nist.gov</a></td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupational Safety &amp; Health Administration</td>
<td>(800) 321-6742</td>
<td>(202) 693-1999</td>
</tr>
<tr>
<td>PBS</td>
<td>Public Buildings Service</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(See GSA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHS</td>
<td>Office of Public Health and Science</td>
<td>(202) 690-7694</td>
<td><a href="http://www.osophs.dhhs.gov/ophs">www.osophs.dhhs.gov/ophs</a></td>
</tr>
<tr>
<td>RUS</td>
<td>Rural Utilities Service</td>
<td>(202) 720-9540</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(See USDA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>State Department</td>
<td>(202) 647-4000</td>
<td><a href="http://www.state.gov">www.state.gov</a></td>
</tr>
<tr>
<td>TRB</td>
<td>Transportation Research Board</td>
<td>(202) 334-2934</td>
<td><a href="http://gulliver.trb.org">http://gulliver.trb.org</a></td>
</tr>
</tbody>
</table>

REFERENCES
E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG Americans with Disabilities Act (ADA) (800) 872-2253
Architectural Barriers Act (ABA) (202) 272-0080
Accessibility Guidelines for Buildings and Facilities
Available from U.S. Access Board
www.access-board.gov

www.gpoaccess.gov/cfr/index.html

DOD Department of Defense Military Specifications and Standards (215) 697-2664
Available from Department of Defense Single Stock Point
http://dodssp.daps.dla.mil

DSCC Defense Supply Center Columbus
(See FS)

FED-STD Federal Standard
(See FS)

FS Federal Specification (215) 697-2664
Available from Department of Defense Single Stock Point
http://dodssp.daps.dla.mil

Available from Defense Standardization Program
www.dps.dla.mil

Available from General Services Administration (202) 619-8925
www.gsa.gov

Available from National Institute of Building Sciences (202) 289-
www.wbdg.org/ccb

FTMS Federal Test Method Standard
(See FS)

MIL (See MILSPEC)

MIL-STD (See MILSPEC)

MILSPEC Military Specification and Standards
Available from Department of Defense Single Stock Point
http://dodssp.daps.dla.mil

UFAS Uniform Federal Accessibility Standards
Available from Access Board
www.access-board.gov

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation
www.dca.ca.gov/bhfti

CCR California Code of Regulations
www.calregs.com

CPUC California Public Utilities Commission
www.cpuc.ca.gov

TFS Texas Forest Service
Forest Resource Development
http://txforestservice.tamu.edu
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200
SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections:

1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.
2. Division 01 Section "Environmental Procedures" for requirements related to waste disposal, sewerage, noise control, temporary erosion and sedimentation control, and other environmental controls.
3. Division 32 Section "Asphalt Paving" for construction and maintenance of asphalt concrete pavement for temporary roads and paved areas.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Project Engineer, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.
1.4 ACTION SUBMITTALS

A. Working Drawings for Temporary Structures: Submit detailed working drawings, in a format approved by Project Engineer, for temporary structures such as falsework and shoring, and for other work as may be required by Project Engineer. Submit backup calculations and any other information needed to explain the systems and their intended use. Take responsibility for such drawings and for the safe and successful construction of the work. All drawings and calculations shall be prepared and sealed by a Professional Engineer registered in the State of Illinois.

1. Comply with requirements of Shop Drawings in Division 01 Section "Submittals."

1.5 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.

1. Indicate sequencing of work that requires water, such as sprayed fire-resistant materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

D. Dust-Control Plan: Submit coordination drawing and narrative that indicates the dust-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Other dust-control measures.
2. Waste management plan.

1.6 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

D. Design Contractor-designed temporary construction in accordance with the appropriate Owner criteria, subject to the inspection and approval of Project Engineer.

E. Project Engineer has the right to reject or condemn any plant, apparatus or staging which, in Project Engineer's opinion, is improper or inadequate. Whether the Project Engineer exercises this authority or not, the Contractor is not relieved of his responsibility for the safe, proper and lawful construction, maintenance and use of such plant, apparatus or staging. Rework condemned plants or equipment to an acceptable condition or remove from the site.

1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Obtain easements as may be required across non-Owner property, and pay all costs (if any) in connection therewith.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails.

B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide concrete or galvanized steel bases for supporting posts.

C. Wood Enclosure Fence: Plywood, 8 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.

D. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10 mils minimum thickness, with flame-spread rating of 15 or less per ASTM E 84.

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, and construction personnel office activities and to accommodate project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
3. Drinking water and private toilet.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. Air Filtration Units: HEPA primary and secondary filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company and Project Engineer for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
   1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Install electric power service overhead, unless otherwise indicated.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
   2. Install lighting for Project identification sign.

H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
1. Provide additional telephone lines for the following:
   a. Provide a dedicated telephone line for each facsimile machine in each field office.

2. At each telephone, post a list of important telephone numbers.
   a. Police and fire departments.
   b. Ambulance service.
   c. Contractor's home office.
   d. Project Engineer's office.
   e. Engineers' offices.
   f. Owner's office.
   g. Principal subcontractors' field and home offices.

3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.

2. Maintain support facilities until Project Engineer schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

   1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

   1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
   2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
   3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction including providing any temporary controls or devices required to eliminate or minimize congestion or obstruction of local vehicular traffic caused by the Work.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
   a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touchup signs so they are legible at all times.

H. Waste Disposal Facilities: Comply with requirements specified in Division 01 Sections "Environmental Procedures" and "Construction Waste Management and Disposal." Comply with Division 01 Section "Execution" for progress cleaning requirements.

I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
3.4 ROADWAYS

A. Unless otherwise specified, use established public roadways and Owner service roads for site access. If temporary roads are required, coordinate the location and the construction with the affected local authorities.

B. The Contractor shall maintain all Owner service roads and temporary roads used during construction. Maintenance shall include but not be limited to removal of snow, mowing grass, collection and disposal of litter and debris near the work, offices, yards and storage areas. Allow all persons engaged in the work free access and use of all such roadways and roads. Contractor shall provide and maintain parking areas equal to roads.

3.5 SITE SECURITY

A. The Contractor shall maintain a secure work site, protecting Owner's interests and property from claims arising from trespass, theft, and vandalism. The Contractor shall be responsible for the total security of the project. The security shall cover, but not necessarily be limited to, security lighting, security fencing and guard service to protect property, personnel, materials and work.

B. Materials and equipment belonging to the Contractor or subcontractors shall not be stored on Railroad property without first having obtained permission from Project Engineer and such permission will be on the condition that the Railroad will not be liable for loss of or damage to such materials and equipment from any cause.

C. The Contractor shall provide such security measures as may be required to protect their tools, equipment, and property and that of their subcontractors from damage, theft, or vandalism.

D. In the event that National Security Levels are increased to Code Orange or Code Red, Owner will immediately reinstate all jobsite security policies for all on-going projects. The requirements are as follows:

1. In addition to the required Amtrak Safety Training ID cards, all individuals working onsite must receive a jobsite specific badge directly from the Contractor, including subcontractors, suppliers, Contractor's staff, design team members and Owner's other project team members. Each badge will have a control number to track the recipient's name and employer. Contractor shall maintain a list of all badges and names on file at the Project Field Office for Owner's daily use.

2. Names and SSN of all Owner's Safety Trained personnel working onsite will be on file with the Amtrak Safety Department and are available to Amtrak Police for their use during a declared heightened state of security.

3. All personnel working onsite or traveling to the site must have available their Project Badge and Amtrak Safety Training ID Cards upon request from Amtrak Police or Project Engineer. Failure to produce the required identification will result in immediate removal from the site.

4. All subcontractor onsite equipment, storage containers and jobsite workboxes are to be on file with the Contractor. All new containers introduced to the site must be recorded with the Contractor's Field Office.
5. All deliveries must be scheduled with Owner prior to delivery to the jobsite. Any and all deliveries are subject to inspection and search by Owner.

3.6 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

B. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

C. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

D. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

3.7 PROTECTION OF PROPERTY

A. Utilities: Before commencing the Work, verify the location of all utility facilities in the vicinity of the Work. Test pitting is required on some utilities. Prior to beginning work affecting any utility facility, submit to Project Engineer for approval a plan for performing the work, with evidence of approval by the utility operator.

B. Protection of Existing Surfaces and Facilities:

1. Take positive action to protect all existing surfaces and facilities from any damage resulting from the Work unless modifications to the surfaces or facilities are required as a part of the Contract.
2. Protect all paving, landscaping, and utility facilities from damage caused by mobile and stationary equipment, including vehicles delivering materials to the site. Any damage shall be repaired at the Contractor's sole expense.
3. Provide and maintain adequate protection for all adjacent structures. When required by law, or for the safety of the work, shore, brace, underpin, or otherwise protect those portions of adjacent structures which may be affected by the work. The Contractor, before commencement of any part of the Work, shall give any notices required to be given to adjoining property owner(s) or other parties.

C. Protection of New Work:
1. All finished surfaces of items shall be clean and not marred upon acceptance of the structure. Refinish all such surfaces that have been inadequately protected and are damaged.
2. The Contractor shall, at all times, provide and maintain adequate protection against weather so as to preserve all work, materials, equipment, apparatus, and fixtures free from injury or damage.
3. Do not use items of equipment or materials that are intended to form a part of the complete work as construction equipment without specific approval from Project Engineer in each instance.
4. Do not load or permit any part of a structure to be loaded so as to endanger its safety.

D. Repair of Damage to Owner Facilities: Any damage to the track, electric traction facilities, catenary towers, signal and communications facilities, and the existing structure caused by the Contractor shall be immediately reported to Project Engineer. All repairs will be made by the Owner at the Contractor's sole expense.

3.8 FIRE PROTECTION

A. Take adequate precautions against fire throughout all operations. Flammable material shall be kept at an absolute minimum and shall be properly handled and stored. Except as otherwise provided herein, do not permit fires to be built or open salamanders to be used in any part of the work.

B. Work practices, including, cutting, welding, and protection during the Work shall be in accordance with the published standards of the Factory Mutual Insurance Association and the National Fire Protection Association. Provide a sufficient number of approved non-freeze portable fire extinguishers distributed about the Project, to the satisfaction of Project Engineer.

C. Store gasoline and other flammable liquids in Underwriter's Laboratories listed safety containers in a conformance with the National Board of Fire Underwriter's recommendations.

3.9 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Operate Project-identification lighting daily from dusk until 12:00 midnight.

D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000
SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Sections:
   1. Division 01 Section "Substitution Procedures" for requests for substitutions.
   2. Division 01 Section "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Project Engineer's Action: If necessary, Project Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Project Engineer will notify Contractor of approval or rejection of proposed comparable product request within 21 calendar days of receipt of request, or seven calendar days of receipt of additional information or documentation, whichever is later.

   a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
   b. Use product specified if Project Engineer does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Project Engineer will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
   1. Store products to allow for inspection and measurement of quantity or counting of units.
   2. Store materials in a manner that will not endanger Project structure.
   3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
   5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   6. Protect stored products from damage and liquids from freezing.
   7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
   3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."
PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Project Engineer will make selection.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
   a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered, unless otherwise indicated.
   b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:
   a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies
with requirements. Comparable products or substitutions for Contractor's convenience will not be considered, unless otherwise indicated.

b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Project Engineer's sample. Project Engineer's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Project Engineer from manufacturer's full range" or similar phrase, select a product that complies with requirements. Project Engineer will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Project Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Project Engineer may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.
PART 3 - EXECUTION (Not Used)

END OF SECTION 016000
SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Sections:

1. Division 01 Section "Submittal Procedures" for submitting surveys.
2. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
3. Division 02 Section "Selective Structure Demolition" for demolition and removal of selected portions of the Structure.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.
B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate how long services and systems will be disrupted.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Project Engineer of locations and details of cutting and await directions from the Project Engineer before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection. Structural elements include, but are not limited to, the following:

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include, but are not limited to, the following:
   a. Primary operational systems and equipment.
   b. Storm water systems.
   c. Industrial Waste systems.
   d. Control systems.
   e. Electrical wiring systems.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to, but are not limited to, the following:

   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Equipment supports.
   d. Piping, ductwork, vessels, and equipment.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Project Engineer for the visual and functional performance of in-place materials.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   a. Description of the Work.
   b. List of detrimental conditions, including substrates.
   c. List of unacceptable installation tolerances.
   d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls and floors for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility or Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field
measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for interpretation to Contracting Officer according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Project Engineer promptly.

B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Project Engineer when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Project Engineer.
3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Project Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Project Engineer before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm
that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Project Engineer.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "Summary."

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage
elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive
Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

   a. Utilize containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300
SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Sections:

1. Division 01 Section "Execution" for progress cleaning of Project site.
2. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Advise Owner of changeover in utilities.
9. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
10. Complete final cleaning requirements, including touchup painting.
11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Project Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Project Engineer will prepare the Certificate of Substantial Completion on Owner's Proc Form 5 "Certificate of Substantial Completion" after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Project Engineer, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Project Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Project Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Project Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use Owner's Proc Form 33 "Construction Punch List."

1. Organize items applying to each space by major element, including categories for walls, floors, equipment, and other systems.
2. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Page number.

3. Submit list of incomplete items in the following format:
   a. PDF electronic file.
   b. Three paper copies of product schedule or list, unless otherwise indicated. Project Engineer will return two copies.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Project Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 calendar days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item, stored on optical CD-ROM. Provide table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Remove snow and ice to provide safe access to the site.

f. Clean exposed exterior hard-surfac ed finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural
weathering of exterior surfaces. Restore reflective surfaces to their original
condition.
g. Remove debris and surface dust from limited access spaces, including
shafts, trenches, equipment vaults, manholes and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Remove labels that are not permanent.
j. Touch up and otherwise repair and restore marred, exposed finishes and
surfaces. Replace finishes and surfaces that cannot be satisfactorily
repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and other required labels and identification,
including mechanical and electrical nameplates.

k. Wipe surfaces of mechanical and electrical equipment and similar
equipment. Remove excess lubrication, paint and mortar droppings, and
other foreign substances.
l. Replace parts subject to operating conditions during construction that may
impede operation or reduce longevity.
m. Clean light fixtures, lamps, globes, and reflectors to function with full
efficiency. Replace burned-out bulbs, and those noticeably dimmed by
hours of use, and defective and noisy starters in fluorescent and mercury
vapor fixtures to comply with requirements for new fixtures.
n. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01
Section "Construction Waste Management and Disposal."

END OF SECTION 017700
SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including National Railroad Passenger Corporation (Amtrak) "General Provisions for Construction Contracts" (General Provisions) and Supplementary General Provisions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings (defined as "As-Built Drawings" in General Provisions).
2. Record Specifications.

B. Related Sections:
   1. Division 01 Section "Closeout Procedures" for general closeout procedures.
   2. Divisions 02 through 49 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with requirements of the General Provisions and the following:

   1. Number of Copies: Submit copies of record Drawings as follows:
      a. Initial Submittal: Submit one set of corrected record Drawings plotted on bond paper from corrected record digital data files and one set of marked-up Record Prints. Project Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Project Engineer will return plots and prints for organizing into sets, printing, binding, and final submittal.
      b. Final Submittal: Submit one set of marked-up record prints, one set of corrected Record Drawings plotted on 4 mil Mylar film from original CAD files, one set of corrected record digital data AutoCAD (Version 2000 or later) files, and one set of corrected record digital data Drawing plots in electronic TIF files. Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy and one copy of annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
C. Reports: Submit written report weekly indicating items incorporated in Project record documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Accurately record information in an acceptable drawing technique.
   c. Record data as soon as possible after obtaining it.
   d. Record and check the markup before enclosing concealed installations.
   e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Locations of concealed internal utilities.
   i. Changes made by Change Order.
   j. Changes made following Contracting Officer's written orders.
   k. Details not on the original Contract Drawings.
   l. Field records for variable and concealed conditions.
   m. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Project Engineer. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
4. Refer instances of uncertainty to Project Engineer for resolution.
   a. Refer to Division 01 Section "Submittal Procedures" for requirements related to use of Architect's digital data files.
   b. Architect will provide data file layer information. Record markups in separate layers.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Project Engineer determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Project Engineer for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each record Drawing; include the designation "AS-BUILT DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "AS-BUILT DRAWINGS."
2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file or scanned PDF electronic file(s) of marked up paper copy of Specifications.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss.

END OF SECTION 017839
SECTION 02 41 19 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of structure.
   2. Demolition and removal of selected site elements.
   3. Salvage of existing items to be reused or recycled.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, store until required, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 CLOSEOUT SUBMITTALS

A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.4 FIELD CONDITIONS

A. Owner will occupy portions of site immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

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

   1. Before selective demolition, Owner will remove the following items:

      a. Any hand tools or operations items.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

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

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

D. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.
3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
   1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."

B. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's storage area designated by Owner.
   5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

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

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

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

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

END OF SECTION 02 41 19
SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Sections

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Material certificates.

C. Material test reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 201, Guide to Durable Concrete.
2. ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
3. ACI 302.1R, Guide for Floor and Slab Construction.
4. ACI 304, Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
5. ACI 305R, Hot Weather Concreting
6. ACI 306R, Cold Weather Concreting
7. ACI 309, Standard Practice for Consolidation of Concrete.
8. ACI 318, Building Code Requirements for Reinforced Concrete (with Supplement).
9. ACI 347, Recommended Practice for Concrete Formwork

E. ASTM Publications: Comply with the following unless modified by requirements in the Contract Documents.
   1. ASTM C 31, Standard Practice of making and Curing Concrete Test Specimens in the Field
   2. ASTM C 94, Specifications for Ready Mix Concrete
   3. ASTM C 881, Specification for Epoxy Resin Base Bonding Systems for Concrete

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests.

G. Preconstruction Conference: Conduct conference at project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS
   A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT
   A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
      1. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length. Repair damaged epoxy coating with field applied epoxy paint.
   B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice.

2.3 CONCRETE MATERIALS
   A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
      1. Portland Cement: ASTM C 150, Type I
a. Fly Ash: ASTM C 618, Class F, with a maximum of 25 percent retained on the Number 325 mesh sieve and a loss on ignition of 1.0 percent maximum.

b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120. Up to 20% of the Portland Cement Content may be replaced by slag cement on a one to one by mass.

c. Silica Fume: ASTM C 1260, Use of up to 5 percent of the weight of the cement content is approved.

A. Normal-Weight Aggregates: ASTM C 33, graded.

B. Maximum Coarse-Aggregate Size: 3/4 inch nominal. Course aggregate shall consist of gravel, crushed gravel, crushed stone or air cooled blast furnace slag or combinations thereof and shall be well graded from fine to coarse within the prescribed limits.

C. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement. Fine aggregate shall consist of natural or manufactured sand or combination thereof, clean and sharp, washed clean and be well graded. Shape shall be generally spherical or cubical. Fineness modulus shall be in the range of 2.30 to 3.00.


2.4 ADMIXTURES

A. General

1. The use of admixtures in concrete shall be restricted to the specific job uses as specified unless otherwise approved in writing by Owner or by subsequent amendment to this Specification.

2. Admixtures shall be free from significant amounts of chloride ions or other ions such that the amount of chloride in fresh concrete mixes does not exceed the limits, expressed as a percentage of cement, specified in ACI 201.2R, Guide to Durable Concrete. Unless approved in writing by Owner, the use of calcium chloride will not be permitted.

3. Certification shall be provided for all admixtures attesting to the conformance to this Specification, including the chloride content in each product.

B. Air-Entraining Admixture: ASTM C 260, except that it shall contain no sulfonated oil or other ingredients that would diminish the bond of epoxy primer or surfacers to the otherwise satisfactory concrete.

C. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2. Retarding Admixture: ASTM C 494/C 494M, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

2.5 VAPOR RETARDERS

A. Not Required.
2.6 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

C. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.8 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

A. Except where specifically indicated to be furnished and/or installed by other trades or under other specifications, furnish and install all embedded and anchorage items including dowels, sleeves, slots, inserts, waterstops, ties, hangers, pipe, electrical conduit, etc., in sufficient quantity and size as indicated or required to insure anchorage sufficient for the purpose intended. Coordinate with work under other sections of the specifications to insure that items not furnished under this specification have been provided prior to placing concrete. Notch out for all slots, chases, recesses or openings indicated on the Drawings or as required.

3.3 VAPOR RETARDERS

A. Not Required.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI’s "Manual of Standard Practice" for placing reinforcement.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Unless shown on the Drawings, joints will not be allowed without the prior written approval of Owner.
2. Provide and prepare construction joints in accordance with the applicable requirements of ACI 301 and ACI 304R.

3. Make construction joints straight and as inconspicuous as possible and in exact vertical and horizontal alignment with the structure as the case may be.

4. Thoroughly clean the surface of the concrete at construction joints and remove laitance, loose or defective concrete, coatings, sand, sealing compounds and other foreign material. Prepare surfaces of joints by sandblasting or other approved methods to remove laitance and expose aggregate uniformly.

B. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/2-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

   1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface by hand floating. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to all surfaces.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to all surfaces

D. Trowel: Apply a first trowel finish to all surfaces.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 033000
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the fabrication, delivery, and erection of all structural steel work. Include brackets, plates, angles, fasteners, anchor bolts, nuts, washers, and the like.

1.2 REFERENCES. The following publications are made a part of this Section only to the extent referenced. No provision of any referenced standard or specification shall be effective to change the duties or responsibilities of the Parties as specifically defined by the Contract Documents.

A. American Society for Testing and Materials (ASTM)

1. A6/A6M-04a Standard Specifications for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
2. A992/A992M-04 Standard Specification for Structural Steel Shapes
3. A36/A36M-04 Standard Specification for Carbon Structural Steel
4. A500-03 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
5. A53/A53M-02 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
7. F1852-02 Standard Specification for Twist Off Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
11. A108-03 Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
12. A307-03 Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
13. D2200-95 Standard Pictorial Surface Preparation Standards for Painting Steel Surfaces

B. American Institute of Steel Construction (AISC)

C. American Welding Society (AWS)
   1. D1.1-2000 Structural Welding Code - Steel

D. The Society for Protective Coatings (SSPC)
   1. SP-6 Commercial Blast Cleaning

1.3 QUALITY ASSURANCE

A. Mill Tests. Certified mill test reports as required by the AISC Specification will be accepted as evidence of conformance of the structural steel to the required ASTM Specification.

B. Shop Inspection. All structural steel work shall be inspected in the shop by an independent testing laboratory approved by the Architect/Engineer. Work not approved by the testing laboratory shall not be shipped to the job. Testing shall include the following.

   1. Confirmation that steel being used conforms to the required ASTM Specification; collect and file copies of certified mill test reports.
   2. Inspection of shop welds in accordance with Article 6.5 of the AWS “Structural Welding Code.”
   3. Inspection of shop painting including also preparation of surfaces.

1.4 SUBMITTALS

A. Shop and Erection Drawings shall be submitted for approval. Shop drawings shall show surface areas of structural steel requiring shop painting and also areas where paint is not to be applied, as applicable. Shop drawings shall call out brand name or other identification of shop paint.

B. Mill Test and Inspection Reports. See applicable requirements in Article 1.3 of this Section. Submit reports periodically to the Architect/Engineer.

C. Welder Certifications. Submit AWS certifications where certified welders are required by other provisions of this Section.

1.5 DELIVERY, STORAGE, AND HANDLING. All material shall be so stored as to protect it from injury of any kind. No damaged material or rusted material shall be used in the structure.
PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel Channels, Angles, M-, HP-Shapes, Plates and Bars shall comply with ASTM A36.

B. Steel Pipe sections shall conform to ASTM A53, Grade B, 35,000 psi yield and 60,000 psi ultimate strength.

C. High Strength Bolts shall conform to ASTM Specification A325, Type 1, and to references therein relative to nuts and washers. Twist-off-type tension-control bolts may be used and shall comply with ASTM Specification F1852. Other alternate fasteners and load indicating devices, if used, shall be in accordance with the criteria in the RCSCEF Specifications, as may be applicable.

D. Heavy-Hex Nuts shall comply with ASTM A563. Provide appropriate grade and finish per ASTM A563 Table X1.1 for intended use.

E. Washers shall comply with ASTM F436. When oversized or slotted holes are used in a connection, washers shall also comply with the special requirements in RCSC Specification, Section 6.

F. Anchor Rods shall conform to ASTM F1554, Grade 36.

G. Threaded Rods shall conform to ASTM A36.

H. Standard Bolts and Nuts shall conform to ASTM Specification A307, Grade A, and to references therein relative to nuts.

I. Primer: See Exterior Painting

J. Paint: See Exterior Painting

2.2 WORKMANSHIP AND DETAILS shall conform to the requirements of the AISC Specifications, except as otherwise shown or specified.

2.3 FABRICATION shall be in accordance with the AISC Specifications.

A. Welding shall be done by properly accredited experienced operators, each of whom shall submit satisfactory evidence (AWS Certifications, or equal) of experience and skill in welding structural steel with the kind of welding to be used in the work and shall demonstrate his/her ability to make uniformly good welds of the types required.

Surfaces to be welded shall be reasonably well cleaned by wire brushing, chipping, and hammering as may be necessary to remove scale, rust, paint, and other foreign matter. Immediately upon completion, each weld shall be wire brushed and examined and shall show uniform section, smoothness of weld metal, feather edges without overlaps, and freedom from porosity and clinkers. Each weld shall show good fusion with and penetration into base metals.

Welding shall be done by the shielded arc process, using coated rods, and in accordance with the AWS "Structural Welding Code." There shall be a copy of this code at the fabricating shop. Other welding processes may be used provided they
are qualified by applicable tests in accordance with AWS procedures. See the AWS Structural Welding Code.

2.4 SHOP PAINTING. Structural steel, unless otherwise specified, shall receive primer paint noted in Article 2.01. Steel, which is to be encased in concrete, shall not be painted but shall be free of grease, oil, and other foreign matter.

Surfaces within 2” of required field welding shall not be painted.

Markings for erection sequences shall be easily removable.

A. Preparation. Work to be painted shall be prepared by sandblasting in accordance with SSPC-SP6 “Commercial Blast Cleaning.” Work shall be painted before any rust or corrosion is visible on the surface. The required inspection shall include frequent comparison with the standard plate for the required sandblasting in accordance with SSPC-SP6 and ASTM D2200, copies of which shall be provided at the work site while the blasting is being done.

B. Painting. All paint shall be applied by skilled painters. Paint shall be applied thoroughly and evenly and well worked into joints and irregularities. Apply two coats or as necessary to a minimum dry film thickness of 2.5 mil.

PART 3 - EXECUTION

3.1 ERECTION. Steel and iron work shall, except as otherwise specified, be erected by a well-qualified steel erection contractor who shall make all measurements necessary for the installation of his work and who shall furnish erection bolts, wedges, temporary bracing, etc. All work shall be plumb, level, or to the slopes shown, as the case may be. Bases, bearing plates, anchor bolts, etc., shall be delivered in place by this subcontractor and set under his supervision. He shall assume full responsibility for the accuracy of location and elevation. All base and bearing plates and other bearings on concrete or masonry shall have full and uniform bearings on ‘non-shrink grout’.

A. Tolerances. Individual pieces shall be erected so that the deviation from plumb, level, and alignment shall not exceed 1 to 500.

B. High Strength Bolting shall be in accordance with the ‘Research Council on Structural Connections of the Engineering Foundation (RCSCEF) Specifications. Provide a copy of this Specification at the work site while the work is in progress. Method of tightening shall be optional with the Contractor, provided that all work is in accordance with the ‘RCSCEF’ Specifications.

Inspection shall be in accordance with the ‘RCSCEF’ Specifications, and shall be by an independent testing laboratory, arranged for and paid for by the Contractor, subject to the Engineer’s approval. Submit reports to the Engineer at one (1) week intervals.

C. Field Welding, if any, shall be in accordance with the AWS, ‘D1.1’ of the Structural Welding Code, as applicable.

D. Clean Up. At a time approved by the Architect/Engineer/Owner after erection is complete, remove, erase, or otherwise obscure erection markings which may be visible in the finished work. Touch up all welds, abrasions, and other damage to the
shop coat of paint where these shall be exposed to view in the finished work. Use the same kind of paint as that of the shop coat.

END OF SECTION 055000
SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.

1.2 PRECONSTRUCTION TESTING


1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each kind and color of joint sealant required.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Preconstruction field-adhesion test reports.

C. Warranties.

1.5 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

B. Qualifications: Provide sealant and coating work performed by a licensed Specialty Sealant and Waterproofing Contractor who is exclusively engaged in sealant application work. All work to be performed by qualified journeymen proficient in the craft of sealant application.

1.6  WARRANTY

A. Apply sealant and coating materials under the supervision of the product manufacturer’s representative.

B. Provide a written Special Guarantee covering replacement of joint sealant and coating work that fails within 1 year of the date of project acceptance. Failure includes:
   1. Becoming brittle or cracking due to exposure, contraction, or expansion.
   2. Failure to resist abrasion of normal use and traffic.
   3. Tear failure due to movement within 25% of joint width for Class A sealants.
   5. Failure to resist chemical attack from long term exposure to diesel fuel.

C. Provide a written Special Guarantee covering replacement of joint sealant and coating work that fails within 5 years of the date of project acceptance. Failure includes:
   1. Failure to repel water and diesel fuel on treated concrete surfaces.
   2. Failure to prevent water and diesel fuel intrusion through treated concrete.
   3. Failure to resist chemical attack from long term exposures to diesel fuel.

D. Provide a written Special Guarantee covering replacement of epoxy crack sealer work for containment concrete that fails within 5 years of the date of project acceptance. Failure includes:
   1. Failure to repel water and diesel fuel on treated concrete surfaces.
   2. Failure to prevent water and diesel fuel intrusion through treated concrete.
   3. Failure to resist chemical attack from long term exposures to diesel fuel.

PART 2 - PRODUCTS

2.1  MATERIALS, GENERAL

A. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.2  JOINT SEALING MATERIALS

A. Joint sealant materials used for sealing interior/exterior concrete joints; including control, construction, and expansion joints shall be:
   1. Horizontal Joints
      a. Thiokol 2282 polysulfide joint sealant as manufactured by PolySpec and recommended for use in secondary containment and immersion conditions with diesel fuel.
2. Vertical Joints  
a. Thiokol 2235M non-sag polysulfide joint sealant as manufactured by PolySpec and recommended for use in secondary containment and immersion conditions with diesel fuel.

B. Joint sealant materials shall meet the requirements of the air quality authority having jurisdiction.

C. Joint sealant materials shall be applied in accordance with the manufacturer's instructions and as described in Part 3 of this Section.

PART 3 - EXECUTION

3.1 CONDITION OF SUBSTRATE

A. Allow concrete to cure per the manufacture’s recommendations before applying joint sealant or coating.

B. Inspect substrates to receive sealant work for:
   1. Deviation beyond allowable tolerance for joint width and required clear joint depth. Joint width shall not be less than ¼ inch or the width shown on the Drawings.
   2. Presence of contaminants, which cannot be removed by normal joint cleaning.

C. Do not start work until unsatisfactory conditions are corrected.

3.2 PREPERATION OF SURFACES

A. Surface preparation prior to application shall be in accordance with the manufacturers recommendations.

B. All surfaces receiving sealants, coatings, or sealers require a clean and dry substrate free of oils, grease, wax, solvents, curing membranes, and any other contaminants.

C. All surfaces receiving sealants and coatings shall be sand blasted, shot blasted, or mechanically prepared to provide an open surface and to remove fines, laitance, and unsound concrete.

D. Insure the cleaned surfaces are not contaminated before applying sealant or coating system.

3.3 APPLICATION

A. General  
   1. All materials shall be applied in accordance with the manufacturer's instructions. Air material, and surface temperatures must be per manufacturer's
recommendation during application. Do not apply materials when rain is expected.

2. Ensure that all components are properly combined and mixed.
3. Apply primer recommended by the manufacturer for all substrates. Avoid getting primer on the face of material or areas that will not be covered.
4. Allow adequate curing time following material application.
5. Where the substrate or adjacent sealants are incompatible with the specified sealant, submit a sealant suitable for the required use and of equivalent life expectancy to the specified sealant.

B. Joint Sealants
1. Expansion, Contraction, and Construction Joints
   a. Install closed cell polyethylene backer rod as shown on the drawings. Backer rod shall be slightly larger than joint so that backer rod can be firmly held in place.
   b. Apply sealant by pouring, pumping or with a caulking gun. When using pump or caulking gun fill joint from the bottom up to avoid air entrapment. Fill joint flush with surface of adjacent material without overfilling or spilling sealant on exposed surfaces.

3.4 ACCEPTANCE

A. Following substantial completion, the Engineer shall verify and document that all concrete surfaces have been sealed or coated according to the contract documents.

B. The Engineer shall visually inspect all treated concrete surfaces and joints to ensure water and diesel fuel repellency. Any areas requiring additional water repellency, sealing, or coating shall be re-worked by the contractor at no additional expense to the Owner.

3.5 CLEANUP

A. Upon completion, remove protective masking and clean any sealant or coating from adjacent finished surfaces beyond edge of working surface.

END OF SECTION 079200
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
   1. Concrete.
   2. Steel.

B. Coat or paint all facilities and equipment, which are part of this Contract, except:
   1. Metal completely embedded in concrete (except aluminum).
   2. Piping buried in ground or encased in concrete.
   3. Galvanized grating, galvanized bolts, and galvanized grating frames.
   4. Chain link fence and galvanized fence gates.
   5. Rubber.
   6. Plastic pipe, including: polyvinyl chloride, polyethylene, and polypropylene piping, except as noted.
   7. Stainless steel.
   8. Bronze, brass.
   9. Nameplates and grease fittings
   10. Factory-finished electrical panels.
   11. Factory fusion epoxy coated items (except for field touchup).
   12. Train rail and rail plates.
   13. Concrete, except as defined herein, as specified elsewhere, or as shown on the Drawings.

C. The contractor is to base this bid on using the products specified. If the products specified are not available in formulations that meet applicable regulations on volatile organic compounds (VOC) levels at time of application, the Contractor is to submit for review products of equivalent quality and function that comply with regulations in effect at that time. A reasonable difference in cost of material between the first named items specified and the products that are required to meet regulations that change after the bid date and are in effect at the time of application may be approved for payment by Change Order.

D. Spray Prohibition: No spraying shall be allowed at the project site. All field-coated items must be rolled or hand applied. Offsite spraying on non-adjacent properties is allowed.

1.2 REFERENCES

A. The major elements of Part 2 – Equipment shall be supplied and constructed in conformance with the latest adopted versions of the following references.
B. Where standards of surface preparation are described by citing SSPC specification numbers reference is made to the “Steel Structures Painting Manual” Volume 2 published by the Steel Structures Painting Council.

C. AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM):

1. ASTM D4060
   Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
2. ASTM D2794
   Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
3. ASTM D4541
   Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
4. ASTM F1249
   Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor

1.3 DEFINITIONS

A. Dry Film Thickness (DFT) – The prime coat and the sum of all fully cured applied coats for the paint system.

B. Exterior Surface – A surface that is not inside a building or structure and is exposed to the weather is considered an exposed surface. Epoxy surfaces that are affected by the ultraviolet rays from the sun shall be considered an exterior surface if the sun can shine on the surface and shall be overcoated with an aliphatic urethane top coat as specified in System 1.

C. Stripe Coat – A stripe coat shall be applied to the edge, corner, welds, or bolts prior to application of additional system coats.

D. Submerged – Surfaces that are under water or the vertical extension of those walls that are partly under water during normal operating conditions.

1.4 ACTION SUBMITTALS

A. Product Data: Prior to ordering material, submit a complete schedule of materials to be used. Include manufacturer’s brand name, product name and designation number for each coat of each system to be used. For each type of product. Include preparation requirements and application instructions.

B. Samples: For each type of paint system and each color and gloss of topcoat.

C. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

D. Provide Material Safety Data Sheets (MSDS) for all products.
1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Perform all work to the satisfaction of the Architect/Engineer.

B. Environmental Regulatory Requirements:
   1. All work, material, procedures, and practices under this Section shall conform to requirements of the local air quality regulatory authority having jurisdiction. Prime or finish coat painting done in locations other than the project site shall be in accordance with air quality regulations in effect at the place that the coating is applied. Products specified herein are, to the best of the Design Engineer's knowledge, in compliance with the applicable volatile organic compounds (VOC) levels allowable at the date these Specifications were issued for bid.
   2. The air quality regulatory authority having jurisdiction may prohibit the sale or application of paints and enamels containing more than the stipulated percentages of volatile organic solvents manufactured after a stated date. Provide material meeting applicable regulations effective at the date of manufacture, or if not available, provide top of the line materials developed as replacements for specified materials and meeting applicable regulations as to VOC solvents content.
   3. If the Contractor applies coatings that have been modified or thinned other than as recommended by manufacturer, he will be responsible for any fines, costs, remedies, or legal actions that may result.

C. Color and Samples:
   1. Provide color samples for Amtrak color selection. Colors are to be factory mixed, using light-fast colorants proportioned by accurate measurement into proper type base. All coatings must be formulated to perform in the climate and environment to which they will be exposed.

D. The recommendations and instructions of the manufacturers of products used in the work are hereby made part of these Specifications, except as they may be superseded by other requirements of these Specifications.

E. Codes: comply with all rules and regulations of authorities having jurisdiction over the work specified herein.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver all coating materials in unopened containers with manufacturer’s label, which must include name, batch number, and date and VOC content.
B. Store in an assigned area onsite with concurrence from the coating manufactureres. Maintain storage area clean and fire safe. Dispose of used rags, thinner and buckets daily. Store solvents in closed approved storage containers.

1.8 PROTECTION / ENVIRONMENTAL REQUIREMENTS / PROJECT CONDITIONS

A. Be advised that application of paint, epoxy and protective coating materials may be hazardous. Take all necessary precautions to ensure the safety of workers and property. Have all material safety data sheets (MSDS) posted onsite and ensure all personnel know the location of the MSDS.

B. The Contractor shall coordinate with all trades and subcontractors to protect materials and/or equipment from surface preparation, blasting and coating system operations.

C. The Contractor shall take precautions necessary to prevent airborne dust creating a nuisance to and/or damaging adjacent businesses, properties and public areas.

D. Use temporary dust barriers to close off areas being blasted from areas where other work is being performed. Provide adequate ventilation.

E. Items to be protected from surface preparation, blasting, and/or coating operations may include; electrical conduit, instrumentation, equipment tags, or name plates.

F. Any material or equipment installed by the Contractor which interferes with, or compromises the application of the coating system, shall be removed and re-installed by the Contractor at no additional expense to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

D. Colors: As selected by Architect from manufacturer's full range.

2.3 PAINT SYSTEMS

A. Paint systems shall include:
   1. Paint System 1:
      a. 1 coat of ferrous metal primer.
      b. 2 coats of medium-oil enamel.

B. Apply paint systems to all exposed top or side surfaces of steel components.

C. Steel components to receive paint systems shall include but are not limited to the following:
   1. Rail flangeway steel
   2. Cover plates, and supports
   3. Exposed piping.

D. Rail, rail clips and steel components which are to be encased in concrete, galvanized, or are not exposed surfaces, shall not receive paint systems but shall be free of grease, oil, etc.

E. Acceptable paint systems to be incorporated in the work include:
   1. System A: Benjamin Moore
      b. Finish Coat: M22-15 Safety Yellow
   2. System B: Devoe Coatings
      a. Primer: Devguard 4141, White
      b. Finish Coat: Devguard 4348, Safety Yellow
   3. System C: Sherwin Williams
      a. Primer: Kern Kromik B50WZ0001
      b. Finish Coat: Industrial Enamel HS, B54YZ0437, Safety Yellow

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 09 91 13
SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

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

1.02 SUMMARY. Section Includes:

A. Stencils
B. Valve Tags

1.03 SUBMITTALS

A. Product Data. For each type of product indicated.
B. Samples. For color, letter style, and graphic representation required for each identification material and device.
C. Equipment Label Schedule. Include a listing of all equipment to be labeled with the proposed content for each label.
D. Valve Numbering Scheme

1.04 COORDINATION

A. Coordinate Installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
B. Coordinate Installation of identifying devices with locations of access panels and doors.
C. Install Identifying Devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 STENCILS. Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, similar operational instructions, and where noted on plans.

A. Stencil Material. Fiberboard or metal.
B. Stencil Paint. Exterior, gloss, black unless otherwise indicated. Paint may be in pressurized spray-can form.
C. Identification Paint. Exterior, in colors according to ASME A13.1 unless otherwise indicated.

2.02 VALVE TAGS

A. Valve Tags. Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material. Stainless steel, 0.025 inch; aluminum, 0.032 inch, or anodized aluminum, 0.032 inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners. Stainless steel wire-link or beaded chain; or S-hook.
PART 3 - EXECUTION

3.01 PREPARATION. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 EQUIPMENT LABEL INSTALLATION

A. Install or Permanently Fasten labels on each major item of mechanical equipment.

B. Locate Equipment Labels where accessible and visible.

3.03 PIPE LABEL INSTALLATION

A. Stenciled Pipe Label Option. Stenciled labels may be provided instead of manufactured pipe labels, at installer's option. Install stenciled pipe labels, complying with ASME A13.1, on each piping system.

1. Identification Paint. Use for contrasting background.
2. Stencil Paint. Use for pipe marking.

B. Locate Pipe Labels where piping is exposed or accessible maintenance spaces such as vaults and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

C. Pipe Label Color Schedule

1. Compressed-Air Piping
   a. Background Color. Blue
   b. Letter Color. White

3.04 VALVE-TAG INSTALLATION

A. Install Tags on valves and control devices in piping systems, except check valves, and valves within factory-fabricated equipment units.

END OF SECTION
SECTION 22 15 13 - GENERAL-SERVICE COMPRESSED-AIR PIPING

PART 1 - GENERAL

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

1.02 SUMMARY

A. This Section includes piping and related specialties for general-service compressed-air systems operating at 200 psig or less.

1.03 DEFINITIONS

A. CR. Chlorosulfonated polyethylene synthetic rubber.
B. EPDM. Ethylene-propylene-diene terpolymer rubber.
C. NBR. Acrylonitrile-butadiene rubber.
D. PE. Polyethylene plastic.
E. Low-Pressure Compressed-Air Piping. System of compressed-air piping and specialties operating at pressures of 150 psig or less.

1.04 SUBMITTALS

A. Product Data. For the following:
   1. Pipes, fittings, and valves.
   2. Dielectric fittings.
   3. Flexible pipe connectors.
B. Qualification Data. For Installers.
C. Field Quality-Control test reports.
D. Operation and Maintenance Data. For general-service compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

1.05 QUALITY ASSURANCE

A. ASME Compliance

PART 2 - PRODUCTS

2.01 PIPES, TUBES, AND FITTINGS

A. Schedule 40, Steel Pipe. ASTM A 53/A 53M, Type S, Grade B, black or hot-dip zinc coated with ends threaded according to ASME B1.20.1.
4. Steel Flanges. ASME B16.5, Class 150 or 300, carbon steel, threaded.
5. Steel Flanges. ASME B16.5, Class 150 or 300, carbon steel.

2.02 JOINING MATERIALS

A. Pipe-Flange Gasket Materials. Suitable for compressed-air piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
      a. Full-Face Type. For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type. For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts. ASME B18.2.1, carbon steel, unless otherwise indicated.


2.03 DIELECTRIC FITTINGS

A. General Requirements for Dielectric Fittings. Combination fitting of copper alloy and ferrous materials with insulating material; suitable for system fluid, pressure, and temperature. Include threaded, plain, or weld-neck end connections that match piping system materials.

B. Dielectric Unions. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180°F
   1. Manufacturers. Subject to compliance with requirements, provide products by one of the following:
      b. Central Plastics Company.
      c. EPCO Sales, Inc.
      d. Hart Industries International, Inc.
      e. Watts Water Technologies, Inc.; Water Products Div.
      f. Zurn Plumbing Products Group; Wilkins Div.

C. Dielectric Flanges. Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
   1. Manufacturers. Subject to compliance with requirements, provide products by one of the following:
      b. Central Plastics Company.
      c. EPCO Sales, Inc.

D. Dielectric-Flange Kits. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
   1. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
   2. Manufacturers. Subject to compliance with requirements, provide products by one of the following:
2.04 FLEXIBLE PIPE CONNECTORS

A. Manufacturers. Subject to compliance with requirements, provide products by one of the following:

1. Flex-Hose Co., Inc.
2. Flexicraft Industries.
3. Hyspan Precision Products, Inc.
5. Metraflex, Inc.
6. Proco Products, Inc.
7. Universal Metal Hose; a Hyspan Company

B. Stainless-Steel-Hose Flexible Pipe Connectors. Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating. 200 psig minimum.
2. End Connections, NPS 2 and Smaller. Threaded union steel pipe.
3. End Connections, NPS 2-1/2 and Larger. Flanged steel nipple.

2.05 SLEEVES

A. Galvanized-Steel Sheet. 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Stack Sleeve Fittings. Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

2.06 SPECIALTIES

A. Safety Valves. ASME Boiler and Pressure Vessel Code. Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.

1. Pressure Settings. Higher than discharge pressure and same or lower than receiver pressure rating.

2.07 GROUT

A. Description. ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

2. Design Mix. 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

A. Compressed-Air Piping. Use the following piping materials for each size range:

1. NPS 2 and Smaller. Schedule 40, galvanized-steel pipe; malleable iron fittings; and threaded joints.
2. NPS 2-1/2 and Larger. Schedule 40, galvanized-steel pipe; wrought-steel fittings; and welded joints.

3.02 PIPING INSTALLATION

A. Drawing Plans, Schematics, and Diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install Piping Concealed from view and protected from physical contact by building occupants, unless otherwise indicated and except in equipment rooms and service areas.

C. Install Piping Indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

D. Install Piping Above accessible ceilings to allow sufficient space for ceiling panel removal and to coordinate with other services occupying that space.

E. Install Piping Adjacent to equipment and machines to allow service and maintenance.

F. Install Air and Drain Piping with 1 percent slope downward in direction of flow.

G. Install Nipples, Flanges, Unions, Transition and Special Fittings, and Valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.

H. Equipment and Specialty Flanged Connections
   1. Use steel companion flange with gasket for connection to steel pipe.

I. Flanged Joints may be used instead of specified joint for any piping or tubing system.

J. Install Eccentric Reducers where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.

K. Install Branch Connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.

L. Install Thermometer and Pressure Gage on discharge piping from each air compressor and on each receiver. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping."

M. Install Piping to permit valve servicing.

N. Install Piping free of sags and bends.

O. Install Fittings for changes in direction and branch connections.

3.03 JOINT CONSTRUCTION

A. Ream Ends of Pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove Scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
C. Threaded Joints. Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads. Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints for Steel Piping. Join according to AWS D10.12/D10.12M.

E. Flanged Joints. Use asbestos-free, nonmetallic gasket suitable for compressed air. Join flanges with gasket and bolts according to ASME B31.9 for bolting procedure.

F. Dissimilar Metal Piping Material Joints. Use dielectric fittings.

3.04 VALVE INSTALLATION

A. Install Shutoff Valves and Unions or flanged joints at compressed-air piping to air compressors.

B. Install Shutoff Valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.

C. Install Check Valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

3.05 DIELECTRIC FITTING INSTALLATION

A. Install Dielectric Fittings in piping at connections of dissimilar metal piping and tubing.

B. NPS 2 and Smaller. Use dielectric unions.
C. NPS 2-1/2 and Larger. Use dielectric flange kits.

3.06 FLEXIBLE PIPE CONNECTOR INSTALLATION

A. Install Flexible Pipe Connectors in discharge piping of each air compressor.

B. Install Stainless-Steel-Hose flexible pipe connectors in steel compressed-air piping.

3.07 CONNECTIONS

A. Install Unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.

B. Install Flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment and machine.

3.08 SLEEVE INSTALLATION

A. Sleeves are not required for core-drilled holes.

B. Permanent Sleeves are not required for holes formed by removable PE sleeves.

C. Install Sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs using galvanized-steel pipe.
D. Install Sleeves for pipes passing through concrete and masonry walls, gypsum board partitions, and concrete floor and roof slabs.

1. Wall Penetrations. Cut sleeves to length for mounting flush with both surfaces.
2. Floor Penetrations. Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

E. Install Sleeves in new walls and slabs as new walls and slabs are constructed.

F. Install Sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.

3.09 LABELING AND IDENTIFICATION. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.10 FIELD QUALITY CONTROL

A. Perform Field Tests and inspections.

B. Tests and Inspections

1. Piping Leak Tests For Metal Compressed-Air Piping. Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
2. Repair leaks and retest until no leaks exist.

C. Prepare test reports.

END OF SECTION
SECTION 23 22 13 - STEAM AND CONDENSATE HEATING PIPING

PART 1 - GENERAL

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

1.02 SUMMARY. This Section includes the following for LP steam and condensate piping:

A. Pipe and Fittings
B. Strainers
C. Steam Traps

1.03 DEFINITIONS

A. HP Systems. High-pressure piping operating at more than 15 psig as required by ASME B31.1.
B. LP Systems. Low-pressure piping operating at 15 psig or less as required by ASME B31.9.

1.04 PERFORMANCE REQUIREMENTS. Components and installation shall be capable of withstanding the following minimum working pressures and temperatures:

A. LP Steam Piping. 15 psig
B. Condensate Piping. 15 psig at 250°F.
C. Blowdown-Drain Piping. Equal to pressure of the piping system to which it is attached.

1.05 SUBMITTALS

A. Product Data. For each type of the following:
   1. Steam trap.
   2. Valve station.
B. Shop Drawings. Detail, 1/4 inch equals 1 foot scale, flash tank assemblies and fabrication of pipe anchors, hangers, pipe, multiple pipes, alignment guides, and expansion joints and loops and their attachment to the building structure. Detail locations of anchors, alignment guides, and expansion joints and loops.
C. Operation and Maintenance Data. For valves, safety valves, pressure-reducing valves, steam traps, air vents, vacuum breakers, and meters to include in emergency, operation, and maintenance manuals.

1.06 QUALITY ASSURANCE

A. Steel Support Welding. Qualify processes and operators according to AWS D1.1, "Structural Welding Code - Steel."
B. Pipe Welding. Qualify processes and operators according to the following:
   1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for welding processes
involved and that certification is current.

C. ASME Compliance. Comply with ASME B31.1, "Power Piping" and ASME B31.9, "Building Services Piping" for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp flash tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.01 STEEL PIPE AND FITTINGS

A. Steel Pipe. ASTM A 53/A 53M, black steel, plain ends, Type, Grade, and Schedule as indicated in Part 3 piping applications articles.

B. Malleable-Iron Threaded Fittings. ASME B16.3; Classes 150 and 300 as indicated in Part 3 piping applications articles.

C. Malleable-Iron Unions. ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 piping applications articles.

D. Wrought-Steel Fittings. ASTM A 234/A 234M, wall thickness to match adjoining pipe.

E. Wrought-Steel Flanges and Flanged Fittings. ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
   2. End Connections. Butt welding.
   3. Facings. Raised face.

F. Steel Pipe Nipples. ASTM A 733, made of ASTM A 53/A 53M, black steel of same Type, Grade, and Schedule as pipe in which installed.

G. Stainless-Steel Bellows, Flexible Connectors
   2. End Connections. Threaded or flanged to match equipment connected.
   4. CWP Rating. 150-psig.
   5. Maximum Operating Temperature. 250°F.

2.02 JOINING MATERIALS

A. Pipe-Flange Gasket Materials. Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
      a. Full-Face Type. For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type. For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts. ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals. ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
D. Welding Filler Metals. Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Welding Materials. Comply with Section II, Part C, of ASME Boiler and Pressure Vessel Code for welding materials appropriate for wall thickness and for chemical analysis of pipe being welded.

2.03 DIELECTRIC FITTINGS

A. Description. Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material. Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions

1. Manufacturers. Subject to compliance with requirements, provide products by one of the following:
   b. Central Plastics Company.
   d. Watts Water Technologies, Inc.
   e. Zurn Plumbing Products Group.

2. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180°F.

D. Dielectric Flanges

1. Manufacturers. Subject to compliance with requirements, provide products by one of the following:
   b. Central Plastics Company.
   c. Watts Water Technologies, Inc.

2. Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric-Flange Kits

1. Manufacturers. Subject to compliance with requirements, provide products by one of the following:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.

2. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

3. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure as required to suit system pressures.

2.04 STRAINERS
A. **Y-Pattern Strainers**

1. Body. ASTM A 126, Class B cast iron, with bolted cover and bottom drain connection.
2. End Connections. Threaded ends for strainers NPS 2 and smaller; flanged ends for strainers NPS 2-1/2 and larger.
3. Strainer Screen. Stainless-steel, 20 mesh strainer, and perforated stainless-steel basket with 50 percent free area.
4. Tapped blowoff plug.
5. CWP Rating. 250-psig working steam pressure.

2.05 **STEAM TRAPS**

A. **Inverted Bucket Traps**

1. Manufacturers. Subject to compliance with requirements, provide products by one of the following:
   b. Barnes & Jones, Inc.
   c. Dunham-Bush, Inc.
   d. Hoffman Specialty; Division of ITT Industries.
   e. Spirax Sarco, Inc.
   f. Sterling.
7. Strainer. Integral stainless-steel inlet strainer within the trap body.

**PART 3 - EXECUTION**

3.01 **LP STEAM PIPING APPLICATIONS**

A. **LP Steam Piping, NPS 2 and Smaller.** Schedule 80, Type S, Grade B, steel pipe; Class 150 malleable-iron fittings; and threaded joints.

B. **LP Steam Piping, NPS 2-1/2 through NPS 12.** Schedule 80, Type S, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.

C. **Condensate Piping Below Grade, NPS 2 and Smaller, shall be the following:**

1. Schedule 80, Type S, Grade B, steel pipe; Class 150 malleable-iron fittings; and threaded joints.

D. **Condensate Piping Below Grade, NPS 2-1/2 and Larger, shall be the following:**

1. Schedule 80, Type S, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.

3.02 **VALVE APPLICATIONS**

A. **Install Shutoff Duty Valves at branch connections to steam supply mains, at steam supply**
3.03 PIPING INSTALLATION

A. Drawing Plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install Piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install Piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install Piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install Piping to permit valve servicing.

F. Install Piping free of sags and bends.

G. Install Fittings for changes in direction and branch connections.

H. Install Piping to allow application of insulation.

I. Select System Components with pressure rating equal to or greater than system operating pressure.

J. Install Groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

K. Install Drains, consisting of a tee fitting, NPS 3/4 full port-ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

L. Install Steam Supply Piping at a minimum uniform grade of 0.2 percent downward in direction of steam flow.

M. Install Condensate Return Piping at a minimum uniform grade of 0.4 percent downward in direction of condensate flow.

N. Reduce Pipe Sizes using eccentric reducer fitting installed with level side down.

O. Install Branch Connections to mains using tee fittings in main pipe, with the branch connected to top of main pipe.

P. Install Valves according to Division 23 Section "General-Duty Valves for HVAC Piping."

Q. Install Unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
R. Install Flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

S. Install Strainers on supply side of control valves, pressure-reducing valves, traps, and elsewhere as indicated. Install NPS 3/4 nipple and full port ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

T. Identify Piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."

U. Install Drip Legs at low points and natural drainage points such as ends of mains, bottoms of risers, and ahead of pressure regulators, and control valves.
   1. On straight runs with no natural drainage points, install drip legs at intervals not exceeding 300 feet.
   2. Size drip legs same size as main. In steam mains NPS 6 and larger, drip leg size can be reduced, but to no less than NPS 4.

3.04 STEAM-TRAP INSTALLATION

A. Install Steam Traps in accessible locations as close as possible to connected equipment.

B. Install Full-Port Ball Valve, strainer, and union upstream from trap; install union, check valve, and full-port ball valve downstream from trap unless otherwise indicated.

3.05 PIPE JOINT CONSTRUCTION

A. Join Pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream Ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove Scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints. Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads. Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints. Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

END OF SECTION
PART 1 - GENERAL

1.1 SCOPE

A. This Section covers basic electrical requirements for providing labor, materials, equipment, and services necessary for the proper completion of all electrical work as shown on the drawings and specified herein. In general, this consists of wiring for power, installation of electrical systems, installation of equipment as hereinafter specified or required. Electrical work shall be complete with all documentation, wiring, conduit, fittings, equipment, and connections as specified or required.

B. The omission of express reference to any items or work necessary for, or reasonably incidental to, a complete installation shall not be construed as releasing the Contractor from providing such items or work.

C. Conditions of the Contract (General and Supplementary Conditions) and Division 1, General Requirements, govern the Work of Divisions 26, 27 and 28 specification sections.

D. This section applies to all work in Divisions 26, 27 and 28 specification sections.

1.2 DEFINITIONS

A. The terms listed below are defined as follows only when used in Division 26, 27 and 28.

1. Work: Labor and materials of the Contractor and/or Sub-contractor.
2. Furnish: Obtain, coordinate, submit the necessary drawings, deliver to the job site in new condition and guarantee.
3. Install: Receive at the job site, unload, store, set in place, connect, place in operation and guarantee.
4. Provide: Furnish and install.
5. Connect: Bring service to the equipment and make final attachment including necessary switches, outlets, connections, etc.
6. Conduit: Includes, in addition to conduit, all fittings, pull boxes, hangers, and other supports and accessories related to such conduit.
7. Concealed: Hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction, in crawl spaces or buried.
8. Exposed: Not installed underground nor concealed as defined above.
9. The building structure or building structural members consist of steel columns, steel beams, steel joists (top chord and at panel points), concrete walls and concrete block walls. Metal decking, joist bridging and bottom chords of bar joists shall not be construed as building structure or as a building structural member for the purpose of support.

B. Provide Electrical work which is finished work, tested and ready for operation.
1. Apparatus, appliances, material or work not indicated or any incidental accessories necessary to make the work complete and ready for operation, even though not specified nor shown on the drawings, are to be provided.

2. Should there be any discrepancies or a question of intent, refer the matter to the Architect/Engineer for decision before ordering equipment or materials and before starting any related work.

3. Where work connects to that of another trade, or to wiring or equipment in place, take measurements in the field to make connecting work come true and line up with the item being connected.

1.3 INSPECTION OF SITE BEFORE CONSTRUCTION

A. Before submitting a proposal on the work contemplated, bidder shall examine the site of the proposed work and thoroughly familiarize himself/herself with existing conditions and limitations affecting the performance of his work. No extra compensation will be allowed because of misunderstanding as to the amount of work involved or the bidder’s failure to verify existing conditions which he could have discovered or reasonably anticipated prior to bidding. Contractor shall be responsible for any additional cutting, patching, mounting or installation modifications, etc., not called out on the drawings but required for the successful completion of the job.

B. This includes any additional work required due to any existing jobsite condition (i.e., the construction of walls, ceiling spaces, clearances, available voltages, mounting requirements, existing equipment coordination, hazardous materials, etc) that the contractor had an opportunity to determine in the pre-bid walk-through and could have reasonably determined before the bid by visual inspection or by asking the Engineer or Owner. No additional money shall be awarded for additional work incurred caused by existing jobsite conditions which could have been verified by the contractor prior to bid. In addition, no additional money shall be awarded for failure to properly coordinate with other trades.

1.4 PLAN INTERPRETATION

A. The plans are diagrammatic and indicate the arrangement of systems and equipment unless indicated otherwise by dimensions or detail plans of 1/4" = 1'-0" scale of larger. Refer to dimensioned plans for exact locations of building elements. However, field measurements take precedence over dimensioned plans. Report any differences discovered between electrical plans and the plans for other divisions. The installation of all systems and equipment is subject to clarification as indicated in reviewed shop drawings.

B. Equipment outlines shown on detailed plans of 1/4" = 1'-0" scale or larger and/or dimensions indicated on the plans are limiting dimensions. Do not install any equipment that exceeds the equipment outlines shown or reduces indicated clearances.
1.5 SUBMITTALS

A. Provide the following submittals.

1. Shop Drawings shall be submitted for approval for equipment listed in the following Division 26, 27 and 28 sections.
2. Wiring diagrams, intra and inter-system, shall be submitted for approval as requested.
3. Samples of equipment or system components shall be submitted for examination/approval as requested.
4. Instructions and Manuals. Provide on-site training and copies of instruction manuals to Owner designated personnel for operation, maintenance and warranty of electrical systems.
5. Test Reports. Reports shall be submitted outlining the results of testing performed for the installed equipment as described herein.
6. As-Built / Record Drawings. Keep layout plans for each system on the job site, marking changes made during installation. At completion of the project, this set of Record drawings shall be submitted as described herein.
7. Warranty. Warranty information shall be submitted upon project completion.
8. Rebates. Contractor shall provide all receipts as necessary for utility rebates and forward to Engineer / Owner. Contractor shall assist rebate application process by providing site data; including existing and proposed device / fixture counts and power usage.

1.6 PERMITS, LICENSES AND FEES

A. The Contractor shall secure all permits and licenses, both temporary and permanent required for his work. The Contractor shall pay all fees and expenses required for the permits and licenses.

1. The Contractor shall make all arrangements with each utility company and pay all service charges associated with new services or modifications to existing services.
2. The Contractor shall request inspections as required by regulating agencies and/or regulations. The Contractor shall pay all charges for inspections.
3. Contractor shall furnish the Owner with a certificate of final inspection and approval by enforcement authorities.
4. Comply with requirements of Division 00.

1.7 QUALITY ASSURANCE

A. Workmanship - All Work on each system complying with these Specifications shall be carried out and/or managed by a competent firm. The respective contractor(s) shall be regularly engaged in the installation and testing of the system that is their responsibility. If requested, the Contractor shall furnish evidence of its qualifications to perform the Work specified. Evidence may be a listing of major lines of equipment for which the Contractor is a dealer. This evidence may also include a list of projects of similar scope and size that the Contractor has performed, including names of contacts and phone numbers for each project.
B. Codes - Materials and workmanship shall comply with the most recently adopted applicable codes. As a minimum, codes include: All State and Federal laws, local ordinances, utility company regulations and requirements and recommendations of the following:

1. State and Local Building codes
2. Life Safety Code
3. International Building Code
5. State Industrial Commission Regulations
6. State and Local Fire Codes and Regulations
7. International Fire Code
9. State and Local Electrical Codes
10. Occupational Safety and Health Administration Regulations
11. Environmental Protection Agency
12. If these specifications with accompanying drawings are in any way at variance with these codes, the above cited codes shall govern and the Contractor shall make this installation accordingly, except where the drawings or specifications call for a higher quality of work than required by the Code.

C. Standards - These shall be used where referenced by the following abbreviations:

1. ADA: American Disabilities Act
2. AIA: American Insurance Association
3. AIA: American Institute of Architects
4. ANSI: American National Standards Institute
5. ASTM: American Society of Testing and Materials
6. EPA: Environmental Protection Agency
7. FM: Factory Mutual Insurance Association
8. IEEE: Institute of Electrical and Electronic Engineers
9. IES: Illuminating Engineering Society of North America
10. NBS: National Bureau of Standards
11. NECA: National Electrical Contractors Association
12. NEMA: National Electrical Manufacturers Association
14. NEIS: National Electrical Information Standards
15. NSC: National Safety Council
16. OSHA: Occupational Safety and Health Act
17. TIA/EIA: Telecommunication Electronic Industry/Electronic Industry Association
18. UL: Underwriter’s Laboratories

1.8 CORRELATION / COORDINATION OF WORK

A. Consult the drawings and specifications of Mechanical and other trades for correlating information and lay-out work so that it will coordinate with other trades. Verify dimensions and conditions (i.e. finished ceiling heights, footing and foundation elevations, beam depths, etc.) with the Architectural and Structural drawings. If conflicts occur such that resolution is not possible by the affected trades on the job, the
Architect/Engineer shall be notified so that the proper changes can be made to avoid extra cost to the Owner.

B. Where work must be replaced due to the failure of the Contractor to verify the conditions existing on the job, such replacement must be accomplished at no cost to the Owner. This shall apply to shop fabricated work as well as to work fabricated in place.

C. Throughout the course of the work, minor changes and adjustments to the installation may be requested by the Engineer. The Contractor shall make adjustments without additional cost to the Owner, where such adjustments are necessary, to the proper installation and operation within the intent of the Contract Documents. This does not include work already completed.

D. Coordinate arrangement, mounting, and support of electrical equipment, so that connecting raceways, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

E. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

F. Coordinate electrical service connections to components furnished by utility companies. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electric-metering components. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

G. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface. Where acoustical ceilings and similar finishes will conceal electrical identification markings and devices, coordinate installation of these items before ceiling installation.

1.9 CORRECTIVE PERIOD / GUARANTEE

A. The Contractor shall guarantee and maintain the stability of work and materials and keep same in perfect repair and condition for the period of one (1) year after the Date of Substantial Completion of the Project.

B. Defects of any kind due to faulty work or materials appearing during the above mentioned period must be immediately made good by the Contractor at his own expense to the entire satisfaction of the Owner and Architect and Engineer. Such reconstruction and repairs shall include damage to the finish or the building resulting from the original defect or repairs thereto.

C. This guarantee shall not apply to injuries occurring after final acceptance and due to wind, fire, violence, abuse or carelessness or other Contractors or their employees or the agents of the Owner.

D. This guarantee shall not apply where other guarantees for different lengths of time are specifically called for.
PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS.
   A. Duly authorized distributors shall represent equipment and systems to be used on this project with service departments regularly engaged in the maintenance and installation of these systems and equipment. Such service departments shall regularly stock standard replacement parts and equipment and shall be located within a reasonable distance from the installation site.

2.2 MATERIALS
   A. Materials and equipment shall be listed, labeled, or certified by a nationally recognized testing laboratory, such as Underwriters Laboratories (UL). Materials and equipment shall be of current production by a manufacturer regularly engaged in the manufacture of such items from which replacement parts shall be available. When items are specified by manufacturer's name or catalog designation, it shall be understood that this is to establish the class, features, quality rating, duty and, in the case of visible building elements such as service fittings, control panels, and the like, appearance.

   B. Specific material sizes, styles, functionality, and options shall be as described in the construction documents. Specification sections may contain sizes, styles, functionality, and options that are not required for the project.

2.3 APPROVAL / SUBSTITUTION OF MATERIALS
   A. Refer to General conditions and Division 01 for approval requirements.

   B. Refer to General conditions and Division 01 for substitution requirements.

   1. Where approved substitutes are used, the Contractor assumes responsibility for physical dimensions and other resulting changes. This responsibility extends to include extra work required by other trades as result of the substitution. Substituted equipment which requires additional costs by other trades in its application shall have such costs borne by the contractor furnishing the equipment.

   2. The Contractor shall assume any costs associated with the replacement of a non-specified product, unapproved by the Engineer, with an as-specified product.

   C. Equipment manufacturers, where indicated on construction documents (drawings and specifications), are the basis for design (size, weight, performance, layout, phase, voltage, current, etc). The Contractor assumes responsibility for all required alterations to shown design conditions when providing equipment other than the design basis.
2.4 MATERIAL PROTECTION

A. Material and equipment shall be protected during shipment and storage against physical damage, dirt, moisture, cold, and rain. During installation, enclosures, equipment, controls, controllers, circuit protective devices, and other like items shall be protected against entry of foreign matter and be vacuum cleaned both inside and outside before testing and operating and repainting if required. Damaged equipment shall be, as determined by the Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement. Damaged paint on equipment and materials shall be refinished to the satisfaction of the Engineer.

2.5 OWNER’S RIGHT OF RETENTION

A. Firmware, hardware, and software which is necessary to run the Project systems and/or equipment provided hereunder, shall become the property of the Owner. Such firmware, hardware, and software shall be upgradable and/or editable by the Owner to facilitate future functional changes and/or additions or deletions without cost or the need for second party software.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Material, equipment, or systems as shown and/or specified shall be new and installed in accordance with manufacturer’s recommendations and industry standards as applicable. Electrical Work shall be installed in a professional, neat, workmanlike manner, as per NECA / NEIS. Electrical equipment shall be adequately and securely mounted and supported.

1. Outdoor/Underground/Wet. All electrical Work installed where subject to the elements and/or water, wash down areas, shall be rated for such areas.
2. Hazardous Locations. All electrical Work installed in classified hazardous areas, i.e. paint storage, shall be rated for such areas.
3. Penetrations. Locate holes in advance where they are proposed in the structural sections such as ribs or beams. Obtain the approval of the Resident Engineer prior to drilling through structural sections. Electrical Work installed between different environments shall be sealed to prevent moisture or contaminants from traveling from one area to another.
4. Grounding / Bonding. Electrical equipment and materials shall be grounded and bonded in accordance with NEC Article 250 and as specified herein or on the drawings.
5. Fireproofing. Electrical materials and equipment shall be installed so as to prohibit the spread of fire. Fire-stop wall, floor, and ceiling penetrations to the same fire-rating as the penetrated wall, floor, or ceiling.
6. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
7. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
8. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

9. Right of Way: Give to piping systems installed at a required slope.

B. Cutting and Patching

1. Perform and provide all cutting and patching of building materials as required for the installation of the work. No structural members shall be cut without the written approval of the Engineer/Architect and any such cutting shall be done in a manner satisfactory to the Engineer/Architect.

2. All patching of or repair of damage to work in place shall be done in a neat and workmanlike manner with the approval of the Engineer/Architect. The Contractor whose operations require cutting of work in place, or who cause damage which entails repairs of such work, shall employ mechanics of the particular trade whose work must be cut or which is damaged, and shall pay all costs of such patching or repair.

3. All holes through pre-cast concrete shall be drilled. Coordinate all pre-cast locations on the architectural and structural drawings.

4. Contractor shall be responsible for any additional cutting, patching, mounting/installation modifications, etc., not called out on the drawings but required for the successful completion of the job. This would include additional work required due to any existing jobsite condition (i.e., the construction of walls, ceiling spaces, clearances, available voltages, mounting requirements, existing equipment coordination, hazardous materials, etc) that the contractor had an opportunity to determine in the pre-bid walk-through and could have reasonably determined before the bid by visual inspection or by asking the Engineer or Owner. No additional money shall be awarded for additional work incurred caused by existing jobsite conditions which could have been verified by the contractor prior to bid. In addition, no additional money shall be awarded for failure to properly coordinate with other trades.

5. Grout – Non-metallic, shrinkage resistant grout: ASTM C 1107, factory packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

C. Excavation, Backfill, and Concrete

1. Provide trenching, excavation, and backfill required for the electrical work. Repair all streets, sidewalks, lawns, curbs or paved areas damaged during / due to work. Sub-surfaces and finished surfaces shall be constructed equal to existing conditions of adjacent materials.

2. Where concrete work is provided by the electrical contractor, concrete shall have compression strength of 4000-psi at 28 days and shall contain 4% to 6% air entrainment.

3.2 DELIVERY, STORAGE, AND HANDLING

A. Store and protect products to be installed or turned over to Owner.
B. Store material and products in a clean and dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect products from dirt, water, construction debris, and traffic. Material and equipment shall be protected during shipment and storage against physical damage, dirt, moisture, cold, and rain. During installation, enclosures, equipment, controls, controllers, circuit protective devices, and other like items shall be protected against entry of foreign matter and be vacuum cleaned both inside and outside before testing and operating and repainting if required. Damaged equipment shall be, as determined by the Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement. Damaged paint on equipment and materials shall be refinished to the satisfaction of the Architect/Engineer.

3.3 CLEAN UP

A. Contractor shall at all times keep the premises free from accumulation of waste material or rubbish caused by his employees or work. Upon completion of the work he shall remove his rubbish, tools, scaffolding, and surplus materials from and about the building, and shall leave his work areas "broom clean" or its equivalent. Electrical equipment shall be cleaned with temporary identification removed. In case of dispute the Owner will remove the rubbish and charge the cost to the Contractor.

B. After tests have been made and accepted, the Electrical Contractor shall go over the whole job and clean light fixtures, panels and other equipment installed by him/her, leaving the entire plant in a clean and complete working order.

3.4 PAINTING

A. Refinish all electrical equipment damaged during shipping and/or installation to its original condition. Remove all rust; prime, and paint per manufacturer's recommendations for finish equal to original.

3.5 FIELD TESTS AND ADJUSTMENTS

A. Work shall, upon completion, be subjected to such tests as are required under industry standards and/or specified herein. Acceptance of the Work by the Engineer shall be contingent upon satisfactory completion of these tests. Actual tests required shall be specified under their respective sections.

B. Prior to completion, the Work shall be subjected to a careful and thorough visual inspection to detect erroneous or loose connections, presence of foreign objects or materials, poor workmanship, incorrect ratings of overcurrent protective devices or equipment, compliance with drawings, or other abnormal conditions.

C. Tests shall be scheduled in advance so that a representative of the Engineer may be present. Test Reports shall be tabulated by the Contractor including the pertinent readings or observations, as well as a statement of the method and specific equipment employed, and shall be filed with the Engineer as part of the permanent Project record. In cases of test failure, it shall be agreed that the corrective measures proposed are
adequate before making repairs. A second test shall be conducted upon completion of repairs, adjustments, or replacements.

D. The Contractor shall provide calibrated test equipment and temporary energy sources as required for tests.

3.6 SUBMITTALS

A. The Contractor shall submit the following information to the Engineer:

1. Shop Drawings shall be first checked by the Electrical Contractor for space/dimensional considerations, performance characteristics, and general conformance to these plans and/or specifications, and shall be so stamped.
   a. Shop drawings not stamped as specified will be returned to the Contractor without action. Contractor’s stamp shall include his corporate name and address, the name of the checker, and the date. They shall then be sent to the General Contractor (as applicable) who will stamp them and forward to the Engineer.
   b. One copy of the shop drawings for any item shall be submitted to the Engineer for approval. Drawing size shall be no larger than 11” x 17”.
   c. Submittals shall be grouped according to specification Section or categories and shall be labeled with the proper name of the project and specification Section. Partial submittals of a group or category will not be reviewed (e.g., submit all panels, all lighting fixtures, etc.).

B. Test Report. Copy of test report, as detailed above, shall be submitted.

C. As-Built / Record Documents. A set of construction documents shall be continuously marked during progress of construction to show actual circuit routing and makeup, equipment location changes, and variations between the project work, record-drawings, and the Contract documents. Such markings shall be made neatly and legibly with red felt-tipped pen. Submit with operation, maintenance and warranty data manuals.

D. Installation and Maintenance Manuals. Copies of Installation Instructions and Operation, Maintenance and Warranty Data Instruction Manuals shall be furnished for electrical equipment furnished. These Manuals shall include parts lists, troubleshooting methods, lubrication recommendations, and calibration instructions. Manuals shall be made up with hard cover post type binders such as Federal ‘Super-Lok.’ Large sheets shall be neatly folded and installed with posthole reinforcements such that the sheets will unfold without need to open binder posts. Manuals shall include index, section tabs, approved shop drawings, installation, operation, maintenance and warranty data instructions packed with equipment, parts lists, and any other data as necessary and/or appropriate for the user to have.

E. Software. Prior to project completion, and before final payment is made, the Contractor shall provide the Owner a hard copy printout of any PLC code and electronic media copies of PLC code and SCADA software, etc.
3.7 COMPLETION OF INSTALLATION

A. System Acceptance. System optimization shall be performed to make sure that each electrical system is properly installed and that all components are working properly. This shall include, but not be limited to:

1. Equipment is functioning properly.
2. Equipment is mounted in the correct location.
3. Equipment is rigidly and securely mounted.
4. Equipment is installed in a neat and visually professional manner.
5. Equipment is clean.
6. The training of operations personnel is complete.
7. Final Inspection. Upon completion of the work, notify the Engineer that the Project is complete and ready for inspection. The Engineer will schedule an inspection and generate a list of items to be corrected or completed before contract closeout. If the Engineer is requested to make a final inspection by the Contractor, and the Engineer finds work is not complete enough to perform that inspection, the Contractor will compensate the Engineer for their time. The Contractor will then perform the necessary work to complete the project and again request a Final Inspection.

B. Training. The Contractor shall furnish training for the operating and maintenance personnel of the Owner of the recommended and proper operation and maintenance of electrical systems. Training shall be both of the classroom type and the hands-on type, and shall cover all areas of maintenance and operation. Training shall be coordinated with the Engineer and Owner to allow videotaping, if requested by Owner.

1. The training period may be either concurrent with the system start-up or follow the start-up period at the Contractor's option; however, if it is given concurrent to the start-up, then the instructing personnel shall be furnished in addition to the start-up personnel and one shall not interfere with the other.
2. Actual training periods and their scopes shall be specified under their respective Section. Scheduling of the Owner's personnel shall be mutually agreed upon between the Contractor and the Project Engineer.

C. Cleanup. Keep the premises free from accumulation of waste material and rubbish. Remove debris from the job site and leave work areas broom clean upon completion of the work.

D. Spare Parts. Spare parts shall be turned over to the Owner at the completion of the Project. The spare parts shall not be used during start-up or warranty. Package spare parts for protection against dirt and moisture.

3.8 GUARANTEE (WARRANTY).

A. Unless specified in another Section, the warranty shall be described herein. The Contractor shall guarantee the equipment and systems to be free of defects in design, equipment, and workmanship for a period of one year from the date of acceptance as issued by the Architect's certificate of completion. The Contractor shall replace, redesign, and correct any equipment that fails within the one-year period.
SECTION 26 05 03 – ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 SCOPE.

A. This Section includes all labor, material, equipment, and services necessary and incidental to complete all the demolition and removal of all electrical systems as noted on the Drawings.

1.2 EXAMINATION

A. Examine the building to determine actual conditions and report any major discrepancies with the Architect/Engineer for clarification. These examinations should include verifying field measurements, circuiting arrangements, and wiring that will be abandoned and that serves only abandoned equipment. Where new additions or penthouses are being constructed by this project that create openings in ceilings areas or roof, field visit the site to determine extent of conduit/wire relocation work and include in Bid.

B. Contractor shall assume in his bid that existing equipment and fixtures to be reused are in good working condition and can be installed without any repairs. If certain items are found to be in need of repair or in unusable condition, Contractor shall notify the Engineer for decision. However, Contractor shall be responsible for any damage caused by him to equipment in removal or handling.

C. The Electrical Contractor shall review the electrical equipment in and around the areas in which demolition work is to be performed. The Electrical Contractor shall submit a written list of items not working or broken to the Architect/Engineer. Upon completion of work, any electrical items not working or broken shall be the Electrical Contractor’s responsibility to repair, unless noted on a list submitted prior to the start of demolition. If no such list is submitted to the Architect/Engineer prior to the start of demolition, the Electrical Contractor shall be made responsible to provide all equipment in working order at the end of the remodeling.

D. Contractor shall be responsible for any additional demolition not called out on the drawings but which is required for the successful completion of the job. This is work required due to an existing jobsite condition (i.e., the construction of walls, ceiling spaces, hazardous materials, etc) that the contractor had an opportunity to determine in the pre-bid walk-through and could have reasonably determined before the bid by visual inspection or by asking the Architect, Engineer, or Owner. No additional money shall be awarded for work caused by existing conditions which could have been verified prior to bid.
1.3 SUBMITTALS

A. Provide documentation of hazardous waste being turned over to a certified hazardous waste disposal company.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

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

PART 3 - EXECUTION

3.1 GENERAL INFORMATION

A. Provide demolition of all existing electrical facilities as shown on the drawings, or required. This includes, but is not limited to, lighting, power, and signal equipment. Existing electrical equipment to be reused is noted on the drawings.

B. If the Owner will be occupying the existing building during construction, provide any temporary connections necessary to maintain services to the existing systems. Provide advance notice of a minimum of four weeks to the Owner of any temporary service outages. Advance notice shall be in writing with copies to the Engineer or Architect/Construction Manager.

C. Coordinate utility service outages with Power Utility Company.

D. Provide temporary wiring and connections to maintain continuity to existing systems in service during construction. Work must not be performed on energized equipment or circuits.

1. Existing Systems: Existing system(s) (includes: Electrical Service, Fire Alarm, Card Access, Security – Intrusion, Security – Cameras, Telecommunication, etc.) shall remain in service until new or modified system is complete and ready for service. Disable system(s) only to make switchovers and/or connections. Obtain permission from Owner and Architect/Engineer at least 24 hours before partially or completely disabling system(s). Minimize outage duration. Provide temporary connections to maintain service in areas adjacent to work area.

3.2 DEMOLITION AND REMODEL WORK

A. Demolish and extend existing electrical work under Provisions of Section 02 41 19, "Selective Demolition" and this section, and as indicated on the Drawings. The Owner shall be offered materials and equipment slated for demolition. Legally dispose of all demolition material and equipment that the Owner has been offered but has not accepted.
B. Coordinate the demolition and/or installation of items by other trades to minimize the effect on existing electrical items to remain. E.C. shall relocate, reroute and/or replace materials needed to maintain existing electrical continuity and/or to maintain accessibility to j-boxes and other access points required by Code. Where modifications require new access panels, the E.C. shall provide them and coordinate size and location with other trades.

C. When existing switches or other outlets are removed, remove all unused wire and raceway, where accessible, back to last active outlet or source. Extend existing circuiting, if required, to continue circuiting to other areas.

1. Devices. Remove all devices in areas that will be remodeled as shown on the drawings. Replace all devices and cover plates in outlets that shall remain. When outlets in walls, ceilings, or floors are being removed that are essential for the operation of other remaining outlets, provide new wiring devices in relocated outlets. Disconnect abandoned flush outlets and remove devices. Provide blank covers.

2. Raceways. Remove abandoned raceways and boxes when exposed or when they interfere with new work of any trades, unless indicated or approved otherwise. When electrical materials are removed, patch and finish building surfaces to match existing finishes.

3. The Electrical Contractor shall remove / protect existing low-voltage cables in areas affected by the demolition. When remodeling is complete, the Electrical Contractor shall reinstall / remove protection of low-voltage cables and confirm all electrical devices and cables are restored to their original working conditions.

4. Permission. Obtain permission in writing from the Owner before interrupting services, branch circuits, communications, or other systems.

3.3 DISPOSITION OF EXISTING MATERIAL AND EQUIPMENT.

A. All material and equipment, which is noted, specified, or required by the Owner to be salvaged, and is not scheduled to be reused or relocated, shall be carefully removed, delivered to the Owner, and stored where directed on site.

1. Carefully remove and store on site all material and equipment noted or specified to be reused or relocated. Thoroughly clean this equipment prior to installation.

2. Remove and properly dispose of all other materials or debris resulting from demolition operations from the site.

3.4 CLEANING AND REPAIR

A. All patching of or repair of damage to work in place shall be done in a neat and workmanlike manner with the approval of the Engineer/Architect. The Contractor whose operations require cutting of work in place, or who cause damage which entails repairs of such work, including wall/paint finish, shall employ mechanics of the particular trade whose work must be cut or which is damaged, and shall pay all costs of such patching or repair.
B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace any damaged circuit breakers and provide closure plates for any vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

3.5 INSTALLATION

A. Reinstall relocated equipment and materials under the provisions of Division 01 and 02.

END OF SECTION 26 05 03
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. This Section includes the following:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.
   3. Sleeves and sleeve seals for cables.

1.3 DEFINITIONS
A. EPDM: Ethylene-propylene-diene terpolymer rubber.
B. NBR: Acrylonitrile-butadiene rubber.

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

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.
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 NFPA 70.
1.6 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

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

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alcan Products Corporation; Alcan Cable Division.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

C. Copper Conductors: Comply with NEMA WC 70.

D. Conductor Insulation: Comply with NEMA WC 70 for Types THW, THHN-THWN and XHHW.

2.2 CONNECTORS AND SPLICES

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

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.4 SLEEVE SEALS

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

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.
5. Or approved equal.

D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Plastic, Carbon steel, or Stainless steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.
PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS
   A. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS
   A. Service Entrance: Type THHN-THWN, single conductors in raceway or Type XHHW, single conductors in raceway.
   B. Exposed Feeders: Type THHN-THWN, XHHW single conductors in raceway.
   C. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, XHHW single conductors in raceway.
   D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, XHHW single conductors in raceway.
   E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2 single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES
   A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
   B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
   C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
   D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
   E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
   F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."
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 and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

C. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
2. For sleeve rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both wall surfaces.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

I. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

J. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.
3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

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

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements.

   a. Perform megger, continuity, phase-to-phase, phase-to-neutral, phase-to-ground, and neutral-to-ground testing.


B. Test Reports: Prepare a written report to record the following:

   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 26 05 19
SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For the following:
   1. Steel slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
1. Steel slotted channel systems. Include Product Data for components.
2. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.; a division of Cooper Industries.
   c. ERICO International Corporation.
   d. GS Metals Corp.
   e. Thomas & Betts Corporation.
   f. Unistrut; Tyco International, Ltd.
   g. Wesanco, Inc.
   h. Or approved equal.
3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
6. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical
conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Hilti Inc.
      2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.
      4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
      5) Or approved equal.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
   a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Cooper B-Line, Inc.; 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.
      6) Or approved equal.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All-steel springhead type.

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.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Space supports for EMT, IMC, and RMC as required by NFPA 70.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69, or Spring-tension clamps.
7. To Light Steel: Sheet metal screws.
8. **Items Mounted on Hollow Walls and Nonstructural Building Surfaces:** Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

### 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

### 3.4 PAINTING

A. **Touchup:** Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. **Touchup:** Comply with requirements in Division 09 painting sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. **Galvanized Surfaces:** Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29
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. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.
B. ENT: Electrical nonmetallic tubing.
C. EPDM: Ethylene-propylene-diene terpolymer rubber.
D. FMC: Flexible metal conduit.
E. IMC: Intermediate metal conduit.
F. NBR: Acrylonitrile-butadiene rubber.
G. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, hinged-cover enclosures, and cabinets.
B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
   1. Custom enclosures and cabinets.
   2. For handholes and boxes for underground wiring, including the following:
      a. Duct entry provisions, including locations and duct sizes.
      b. Frame and cover design.
      c. Grounding details.
      d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
      e. Joint details.
1.5 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

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

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 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.
7. Maverick Tube Corporation.

C. Rigid Steel Conduit: ANSI C80.1.

D. Aluminum Rigid Conduit: ANSI C80.5.

E. IMC: ANSI C80.6.

F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

G. EMT: ANSI C80.3.

H. FMC: Zinc-coated steel.

I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

2. Fittings for EMT: Steel compression type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

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

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX 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.

C. ENT: NEMA TC 13.

D. PVC: NEMA TC 2 or Type EPC-40-PVC, unless otherwise indicated.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

2.3 METAL WIREWAYS

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

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.
4. Or approved equal.
2.4 NONMETALLIC WIREWAYS

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

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hoffman.
2. Lamson & Sessions; Carlon Electrical Products.
3. Panduit.
4. Wiremold.

C. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.5 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:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
7. RACO; a Hubbell Company.
10. Spring City Electrical Manufacturing Company.
14. Or approved equal.

C. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

D. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum or galvanized, cast iron with gasketed cover.

H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

I. Cabinets:
   1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.

2.6 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
2.7 SLEEVE SEALS

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

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.
5. Or approved equal.

D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Plastic, Carbon steel, or Stainless steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Aboveground: Rigid steel conduit EMT.
3. Underground Conduit: RNC, Type EPC-40 or 80-PVC, direct buried.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or 4.

B. Minimum Raceway Size: 3/4-inch trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. 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.

H. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

I. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

J. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

K. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet.

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
   d. Attics: 135 deg F temperature change.
2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.

3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

C. Rectangular Sleeve Minimum Metal Thickness:
   1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
   2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed or unless seismic criteria require different clearance.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

I. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

J. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.4 SLEEVE-SEAL INSTALLATION

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

3.5 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33
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. Identification for raceways.
   2. Identification of power and control cables.
   3. Identification for conductors.
   5. Warning labels and signs.
   6. Instruction signs.
   7. Equipment identification labels.
   8. Miscellaneous identification products.

1.3 SUBMITTALS

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

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE


B. Comply with NFPA 70.


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.
1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

G. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
   2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS  
A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Colors for Raceways Carrying Circuits at 600 V and Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS  
A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

D. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
   2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

E. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS  
A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
B. **Self-Adhesive Vinyl Labels:** Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. **Snap-Around Labels:** Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. **Snap-Around, Color-Coding Bands:** Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. **Marker Tapes:** Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

F. **Write-On Tags:** Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

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

### 2.5 WARNING LABELS AND SIGNS

A. **Comply with NFPA 70 and 29 CFR 1910.145.**

B. **Self-Adhesive Warning Labels:** Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. **Baked-Enamel Warning Signs:**

   1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
   2. 1/4-inch grommets in corners for mounting.
   3. Nominal size, 7 by 10 inches.

D. **Metal-Backed, Butyrate Warning Signs:**

   1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
   2. 1/4-inch grommets in corners for mounting.
   3. Nominal size, 10 by 14 inches.

E. **Warning label and sign shall include, but are not limited to, the following legends:**

   1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.6 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.
   3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.7 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.


E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
   2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to plus 185 deg F.
B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
   2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to plus 185 deg F.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
   2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
   3. UL 94 Flame Rating: 94V-0.
   4. Temperature Range: Minus 50 to plus 284 deg F.
   5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 30-foot maximum intervals.

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.

b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.
4) Neutral: White.
5) Ground: Green.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.
4) Neutral: Grey.
5) Ground: Green.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

D. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction
signs with approved legend where instructions are needed for system or equipment operation.

E. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
   a. Outdoor Equipment: Engraved, laminated acrylic or melamine label or Stenciled legend 4 inches high.
   b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:
   a. Enclosures and electrical cabinets.
   b. Access doors and panels for concealed electrical items.
   c. Contactors.
   d. Remote-controlled switches, dimmer modules, and control devices.

END OF SECTION 26 05 53
SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Clearing and grubbing.
   2. Stripping and stockpiling topsoil.
   3. Removing above- and below-grade site improvements.
   4. Disconnecting, capping or sealing site utilities.
   5. Temporary erosion- and sedimentation-control measures.

1.2 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

E. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
1. Arrange with utility companies to shut off indicated utilities.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

3.4 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.5 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 10 00
SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparing subgrades for walks, pavements and tracks.
2. Excavating and backfilling for structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete pavements.
5. Excavating and backfilling for utility trenches.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Ballast: Crushed stone aggregate layer placed between and around the rail ties and the subballast. Refer to Division 34 Section “Ballast”

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
H. Subballast: Aggregate layer placed between the subgrade and the ballast layer for track installation.

I. Subbase Course: Aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 PROJECT CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 6 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Fill: Densely graded aggregate conforming to Illinois Department of Transportation gradation number 6 (CA-6) per ECS Geotech report No. 16.9254 attached to this specifications appendices.

D. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

E. Subballast: Refer to Division 34 Section “Subballast”.

F. Ballast: Refer to Division 34 Section “Ballast”.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by
metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 SUBGRADE INSPECTION

A. Reference ECS Geotechnical Report No. 16.9254 in these specifications appendices for subgrade preparation.

B. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.4 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.5 STORAGE OF SOIL MATERIALS

A. Remove borrow soil materials and excavated satisfactory soil materials from site.

3.6 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Use engineered fill.

3.7 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.8 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 98 percent.
2. Under walkways, proof roll and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, proof roll and compact each layer of backfill or fill soil material at 92 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 92 percent.
3.9 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

   1. Turf or Unpaved Areas: Plus or minus 1 inch.
   2. Walks: Plus or minus 1 inch.
   3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.10 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

   1. Shape subbase course and base course to required crown elevations and cross-slope grades.
   2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
   3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace
soil materials to depth required; recompact and retest until specified compaction is obtained.

3.12 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.13 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00
SECTION 315000.23 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section includes temporary excavation support and protection systems.
B. Related Sections include the following:
   1. Section "Temporary Facilities and Controls" for temporary utilities and support facilities.
   2. Section "Earthwork" for excavating and backfilling and for existing utilities.

1.3 PERFORMANCE REQUIREMENTS
A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.
   1. Provide professional engineering services needed to assume engineering responsibility, including preparation of Shop Drawings and a comprehensive engineering analysis by a qualified professional engineer.
   2. Prevent surface water from entering excavations by grading, dikes, or other means.
   3. Install excavation support and protection systems without damaging existing buildings, pavements, and other improvements adjacent to excavation.

1.4 SUBMITTALS
A. Shop Drawings for Approval: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems.
   1. Include Shop Drawings and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

B. Qualification Data: For Installer and professional engineer.

C. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems.

1.5 PROJECT CONDITIONS
A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.
2. The geotechnical report is referenced elsewhere in the Project Manual.

C. Survey adjacent structures and improvements, employing a qualified professional engineer or land surveyor; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of 4 inches.

E. Shotcrete: Comply with Division 3 Section "Shotcrete" for shotcrete materials and mixes, reinforcing, and shotcrete application.

F. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

G. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

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

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces is not impeded.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SOLDIER BEAMS AND LAGGING

A. Install steel soldier beams before starting excavation. Space soldier beams at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier beams as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at centers indicated and secure to soldier beams.

3.3 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

A. Tiebacks: Drill for, install, grout, and tension tiebacks into position. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.

2. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 BRACING
A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work, unless otherwise approved by Architect.
2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
2. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

B. Leave excavation support and protection systems permanently in place.

3.7 SHEETING AND SHORING TO SUPPORT TRACKS

A. Footings for all piers, columns, walls, or other facilities shall be located and designed so that any temporary sheeting and shoring for support of adjacent track or tracks during construction, will not be closer than toe of ballast slope. The dimension from gage of rail to toe of ballast, along tangent track, is 7'-5"; see dimensions on Track standard plans for curved track dimensions.

B. Use of sheeting: When support of track or tracks is necessary during construction of the above-mentioned facilities, interlocking steel sheeting, adequately braced and designed to carry Cooper E80 live-load plus 50 percent impact allowance is required. Soldier piles and lagging will be permitted for track support ONLY when required penetration of steel sheet piling cannot be obtained, due to site-specific conditions that make steel sheet piling placement impracticable, in the opinion of the Engineer.

1. For usual soil conditions and limited excavations, sheeting is required when the near-track excavation extends beneath or nearer to the track than the Theoretical Railroad Embankment Line. The Theoretical Railroad Embankment Line is defined as a line that starts at grade, ten foot from the centerline of the outer track, and extends downward, away from the track, at a slope of 1-1/2 horizontal to one vertical.
2. For special soil conditions, such as soft organic soils and rock conditions, and for unusual excavation conditions, temporary supports for excavations may be necessary even when the limits fall beyond the Theoretical Railroad Embankment Line, requiring site specific analysis by a professional, geotechnical engineer.
3. See attached Sketch SK-1, "Normal Requirements for Sheet Piling Adjacent to Tracks”.

C. Exploratory trenches, three feet deep and 15 inches wide in the form of an “H”, with outside dimensions matching the proposed outside dimensions of sheeting, shall be hand dug, prior to placing and driving the sheeting, in any area where railroad or utility underground installations are known or suspected. These trenches are for exploratory purposes only, and shall be backfilled and immediately compacted, in layers. This work shall be performed only in the presence of the Engineer.
D. Absolute use of track is required while driving sheeting adjacent to running track. Track usage shall be prearranged per standard procedures, through the Engineer.

E. Cavities adjacent to sheet piling, created by pile driving, shall be filled with sand, and any disturbed ballast shall be restored and tamped immediately.

F. Sheet piling cutoffs
   1. During construction, sheeting shall be cut off at an elevation no higher than the top of tie.
   2. At the completion of construction activities involving the use of sheet piling, sheet piling may be pulled if there will be no adverse impact to the railroad track support bed, as determined by the Engineer. This will generally be permitted when both of these conditions are met:
      a. the sheeting face is at least ten feet distant from the centerline of track, and
      b. the bottom of the excavation that the sheeting supported prior to backfilling, does not fall within an assumed influence zone under the tracks. The assumed influence zone is defined as the area, as seen in cross-sectional view, falling beneath the Theoretical Underground Track Disturbance Line. This line is defined as a line that starts at the end and bottom of the ties, and extends from the track outward and downward at a one-to-one (45-degree) slope.
   3. Sheet piling that is to be left in-place, shall be cut off below the ground line
      a. at least eighteen inches below final ground line at the sheeting, and
      b. no higher than 24 inches below the elevation of the bottom of the nearest ties
   4. See Sketch SK-1, “Normal Requirements for Sheet Piling Adjacent to Tracks”.

G. The excavation adjacent to the track shall be covered, ramped and protected by handrails, barricades and warning lights, as required by applicable safety regulations, and as directed by the Engineer.

H. Final backfilling of excavation shall conform to project specifications.

I. Provide a detailed schedule of proposed construction operations, detailing each step of the proposed temporary construction operations in proximity to tracks, for review and approval of the proposed operations, and to properly inspect and monitor operations.

J. Drawings for the proposed temporary sheeting and shoring shall be signed and sealed by a Licensed Professional Engineer. Complete design calculations, clearly referenced to the drawings, and easy to review, shall be provided with submission of drawings.

K. Where site specific conditions impose insurmountable restrictions to the design of temporary construction conforming to the limitations listed above, the design of temporary construction shall be developed in close coordination with the Engineer. The Engineer will provide final approval of temporary construction that does not conform to the above limitations.
   1. When the Engineer grants approval for sheeting closer than standard minimum clearances, the Contractor shall develop a survey plan, if not already required by the project, for the adjacent tracks, to be conducted prior to, during, and after the temporary sheeting construction operations. If settlement is detected, construction operations shall be suspended until the track has been returned to its initial condition, and stabilized, as determined by the Engineer.
   2. The Contractor shall stockpile ten (10) tons of approved ballast at the project site, and maintain that amount in ready reserve, to allow for the possible need to restore track profile.

L. Particular care shall be taken in the planning, design and execution of temporary construction, as relates to railroad slope protection and drainage facilities. Erosion and sediment control best management practices shall be designed and employed, as approved by the Engineer. Any
unintended disruption to railroad drainage facilities, caused by the temporary construction, shall be promptly remedied, as directed by the Engineer, solely at the Contractor’s cost.

M. Sketch SK-1 (See next page.)
NORMAL REQUIREMENTS FOR SHEET PILING ADJACENT TO TRACK

1. EXCAVATIONS WITHIN ZONE 1 - ABOVE AND OUTSIDE OF THE THEORETICAL RAILROAD EMBANKMENT LINE - DO NOT NORMALLY REQUIRE SHEETING TO PROTECT RAILROAD ROAD BED. SHEETING MAY BE REQUIRED FOR OTHER REASONS.

2. EXCAVATIONS WHOSE BOTTOMS EXTEND INTO ZONE 2 REQUIRE SHEETING, BUT THE SHEETING MAY NORMALLY BE PULLED AFTER THE EXCAVATION HAS BEEN BACKFILLED.

3. EXCAVATIONS WHOSE BOTTOMS EXTEND INTO ZONE 3 WILL NORMALLY REQUIRE THE SHEETING TO BE LEFT IN PLACE AND CUT-OFF PER REQUIREMENTS.

END OF SECTION 315000.23

EXCAVATION SUPPORT AND PROTECTION 315000.23 - 7 of 7
SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Hot-mix asphalt patching.
   2. Hot-mix asphalt paving.

B. Related Requirements:
   1. Section 31 20 00 "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.

1.2 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each paving material. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.

B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Washington DOT for asphalt paving work.

   1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

B. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

C. Mineral Filler: ASTM D 242/D 242M or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.
2.2 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by the Washington Department of Transportation; and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

C. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

3.2 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Spread mix at a minimum temperature of 250 deg F.
2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.3 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day’s work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.4 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
   1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
   1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.
3.6 WASTE HANDLING

A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 01 74 19 "Construction Waste Management and Disposal."

END OF SECTION 32 12 16
SECTION 330500 – COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General Provisions and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement Division 33 Sections:
   
   1. Piping materials and installation instructions common to most piping systems.
   2. Mechanical sleeve seals.
   3. Equipment nameplate data requirements.
   4. Mechanical demolition.
   5. Touch-up painting and finishing.

B. Pipe and pipe fitting materials are specified in Division 33 Section “Industrial Waste Utility Piping.”

1.3 DEFINITIONS

A. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include yard locations.

B. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.

1.5 QUALITY ASSURANCE

A. Comply with Drawings and ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for slots and openings in building structure during progress of construction, to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Mechanical Sleeve Seals:
      a. Thunderline/Link-Seal
2.2 PIPE AND PIPE FITTINGS

A. Refer to individual Division 33 piping sections for pipe and fitting materials and joining methods.

B. All pipe fittings shall be factory fabricated, manufactured, and labeled as “Manufactured in USA”.

C. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 33 piping sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, non-metallic, flat, asbestos-free, 1/8” maximum thickness unless thickness or specific material is indicated.
   2. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   3. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
   4. AWWA C110, Buna-N rubber, flat face, 1/8” thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.


G. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
   2. Followers: ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 536 ductile iron.
   3. Gaskets: Rubber
   5. Finish: Enamel paint.

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include 304 or 316 stainless steel connecting bolts and pressure plates.
2.5 PIPING SPECIALTIES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Cast Iron: Cast or fabricated “wall pipe” equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.6 GROUT

A. Nonshrink, Non-metallic Grout: ASTM C 1107, Grade B.


2. Design Mix: 5000-psi, 28-day compressive strength.


PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping sections specify otherwise.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping at indicated slope.

D. Install components with pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

J. Install fittings for changes in direction and branch connections.

K. Install couplings according to manufacturer’s written instructions.
L. Sleeves are not required for core-drilled holes.

M. Permanent sleeves are not required for holes formed by removable PE sleeves.

N. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2” above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

   b. Exception: Extend HDPE sleeves to allow welding of HDPE primary and secondary containment liners to sleeves.

2. Build sleeves into new walls and slabs as work progresses.

3. Seal penetrations using sleeves. Size sleeve per manufacturer’s requirements to allow adequate annular clear space between pipe and sleeve for installing mechanical sleeve seals. Use the following sleeve materials:

   a. Steel Pipe Sleeves, unless noted otherwise: For pipes smaller than 2” NPS.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants.

5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

P. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves. Size sleeve per manufacturer’s requirements to allow adequate annular clear space between pipe and sleeve for installing mechanical sleeve seals.

   1. Install steel pipe for sleeves unless noted otherwise.

Q. Underground, Exterior-Wall Pipe Penetrations: Install steel “wall pipes” for sleeves unless noted otherwise. Seal pipe penetrations using DFO resistant rubber link seal. Size sleeve per manufacturer’s requirements to allow adequate annular clear space between pipe and sleeve for installing mechanical sleeve seals.

   1. Assemble and install mechanical sleeve seals according to manufacturer’s written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

R. Verify final equipment locations for roughing-in.

S. Refer to equipment specifications in other sections of these Specifications for
roughing-in requirements.

T. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
   b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
   c. Align threads at point of assembly.
   d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
   e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
5. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
6. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
   a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   b. PVC Pressure Piping: ASTM D 2672.
   c. PVC Nonpressure Piping: ASTM D 2855.
   d. PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.
7. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 procedures and manufacturer’s written instructions.
a. Plain-End Pipe and Fittings: Use butt fusion.
b. Plain-End Pipe and Socket Fittings: Use socket fusion.

U. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2” NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2” NPS or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2” NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.

3.2 DEMOLITION

A. Disconnect, demolish, and remove Work specified in plans.

B. If pipe, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

C. Accessible Work: Remove indicated exposed pipe in its entirety.

D. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2” beyond face of adjacent construction. Cap and patch surface to match existing finish.

E. Removal: Remove indicated equipment from Project site.

F. Temporary Disconnection: Remove, store, clean, paint, reinstall, reconnect, and make operational equipment indicated for relocation.

3.3 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.4 GROUTING

A. Install nonmetallic, nonshrink grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer’s written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.
F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer’s written instructions.

END OF SECTION
SECTION 34113.23 - TRACKWORK

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. The work specified in this section consists of the construction of new CWR track on concrete ties, including ballasting, lining, surfacing, and welding.

B. Related Work Specified Elsewhere:

1. Division 34 Section “Subballast”
2. Division 34 Section “Ballast”
3. Division 34 Section “Grade Crossing”

1.3 QUALITY ASSURANCE

A. Codes, Regulations, Reference Standards and Specifications:

4. American Society for Testing and Materials (ASTM) E164-Ultrasonic Contact Examination of Weldments

B. Noted restrictions:

1. Nicked or gouged rails will be rejected by Railroad.
2. Contractor shall not cut rail strings except as required to fit rail to turnouts or crossings.

C. Required Procedures:

1. Rail layout and staking shall be by a land surveyor registered in the State of Illinois.
2. Perform field welding under the direct supervision of an experienced welding foreman or supervisor with a minimum of two years experience in field flash butt or thermite railroad welding. Railroad will approve welders and welding supervisors.
3. Perform tolerance, location and field tests continuously during welding and
a. Test rail welds through the use of a testing agency using the Ultrasonic testing method in accordance with ASTM E164.

b. Each completed weld shall have full penetration and complete fusion and be entirely free of cracks. Total area of internal defects such as porosity and slag inclusions shall not exceed 0.060 square inch and the largest single porosity or slag defect permitted shall not exceed 1/8" in diameter.

1.4 SUBMITTALS – FOR APPROVAL BY AMTRAK

A. Shop drawings and product data.

B. List and description of all construction equipment to be used in installing track.

C. Plan for handling and installation of new track.

D. Qualifications of Welders and Supervisors

E. Qualifications of Personnel Performing Inspections.

F. Field Welding: Materials, methods and procedures to be used for field welding of CWR shall include the following items:

1. Manufacturer's trade name for the welding process.
3. Minimum and maximum spacing between rail ends.
4. Method for maintaining the rails in alignment during welding.
5. Method for preheating including time and temperature.
6. Tapping procedure including the minimum time required to cool the weld under the mold insulation.
7. Method including a description of special tools and equipment for removing the gates and risers and finishing the weld to the final contour.
8. Details for compromise welds for different rail sections to be joined.

G. Manufacturer's certifications for all materials.

1.5 DELIVERABLES

A. Certifications and test reports.

B. Rail temperature and anchoring record.

C. Field welding record continuously maintained and furnished bi-weekly to the Railroad. Record shall include the following details:

1. Date and time of weld(s).
2. Location by station, stating track and rail.
3. Contractor's foreman.
4. Weather, air and rail temperature.
5. Track condition, anchorage and rail stress.

D. Rail Anchorage Record.

PART 2 - PRODUCTS

2.1 GENERAL

A. All track materials shall be new unless otherwise indicated.

2.2 STEEL RAILS

A. Furnish at the site as continuous welded rail (CWR).

B. New 136 pound RE section conforming for profile and manufacture with AREMA specifications, Chapter 4, Part 2.

C. Rail shall be continuously welded by the flash butt, thermite, or other approved welding process, in accordance with the requirements of Amtrak MW 1000.

2.3 RAIL FASTENERS

A. Standard track with wood ties - Pandrol rail fastening system consisting of elastic fastening "e" type clips and elastic fastener tie plates, or approved equal.

B. Standard track with concrete ties - Pandrol rail fastening system consisting of elastic fastening "fastclip" type clips or approved equal.

C. Standard track on steel plates – Pandrol rail fastening system consisting of weld on shoulders with ‘e’ clip type clips or approved equal.

2.4 NYLON INSULATOR

A. Compatible with 136 RE rail and the rail fastening system with a shape factor for orientation during installation.

B. Composed of thermoplastic or nylon.

C. Marked in a permanent manner to indicate manufacturer and pad identification.

2.5 JOINT BARS

A. High carbon steel for use on running rail, guard rails, and for insulated joints, of the type and quality conforming to AREMA Manual, Chapter 4, Part 2, Page 9, for required rail section. Joint bars shall have six bolt holes and be 36 inches long.

2.6 TRACK BOLTS, NUTS AND SPRING WASHERS

B. Spring washers: Conform to AREA Manual, Chapter 4, Part 2.

2.7 INSULATED JOINTS

A. Epoxy bonded full contact type, 36 inches long plus or minus 1/8 inch, pre-assembled by the manufacturer and fabricated from material that meets or exceeds the requirements of AREMA Section 42, except as herein noted otherwise.

B. Joint bar with tapered outer edge and finishing height, with insulation, within plus zero to minus 1/32 of an inch of the standard rail section; no stamping of branding on contact surfaces. Contact surface of the joint bars adjacent to the rail smooth and straight within plus or minus 1/32 of an inch using a 36 inch straight edge. High strength bolts, nuts and washers conforming to ASTM A490 or A325; washers heat treated with a Rockwell hardness of C38 to C45.

C. Rail: Cut rail ends; 4 inch hardened end by the manufacturer with non-heat treated rail. Final assembly length not less than 19 feet 6 inches and as approved by the railroad.

D. Insulation: Characteristics greater than or equal to fiber insulation meeting the requirements of AAR Manual Part 116, paragraph 8 with electrical resistance of 240,000 ohms to indefinite. End post thickness 0.355 inch minimum, 0.395 maximum. Structural adhesive bonding agent shall produce minimum lap shear strength of 3,500 psi at 75 degrees F in accordance with ASTM D1002.

2.8 BALLAST

A. Conform to Section 341126.13 Ballast

PART 3 - EXECUTION

3.1 PREPARATION

A. Transmit submittals and deliverables required by this Section.

B. Furnish products as indicated.

C. Ensure substrates are in suitable condition to receive the work of this Section.

3.2 GENERAL PROCEDURES

A. Submit details of the construction procedures to meet the track requirements and tolerances specified.

B. Perform final correcting alignment.

3.3 BALLAST

A. Ballast section: Conform to the typical sections and cross sections indicated.
3.4 CROSS TIES

A. Lift ties and support during storage, transportation, and placing to prevent damage. Do not drop to the roadbed.

B. Damaged ties shall be removed and replaced.

C. Installation and placement:
   1. Place concrete cross ties on 24 inch centers.

3.5 INSTALLING TRACK ON BALLAST

A. Submit equipment for approval to the Railroad.

B. Install, tamp, lay and raise track over ballast as follows:
   1. Install ballast over compacted subballast which has been approved by the Railroad.
   2. Assemble track on the compacted ballast to permit placement of additional ballast for subsequent raising and tamping and to provide the full depth under the ties.
   3. The final track raise shall not exceed 3 inches, and the ballast shall be compacted with a 16 tool vibrating squeeze-type mechanical tamper making one full tamping insertion per tie for each inch of raise. Compact ballast in the crib areas by a means approved by the Railroad. Raise, align and tamp track to within the specified tolerances.
   4. Tamp ballast within a space from 15 inches inside either rail to the ends of the ties. Tamping is not permitted at the center of the tie except within limits of turnouts and crossings.
   5. Use pneumatic or electric tamping tools, either hand held or machine mounted. Hand tamping with shovels or picks will not be permitted unless authorized by the Railroad.
   6. Use two tamping tools opposite each other on the same tie. Start tampers from a nearly vertical position and work downward past the bottom of the tie, after which the tool should be slanted downward to force ballast under the tie.
   7. Mechanically dress ballast to provide the proper section as indicated.
   8. Remove excess ballast or place as directed by the Railroad.
   9. Remove and replace overworked and excessively tamped ballast as determined by the Railroad.
   10. Tamp all track after it has been raised to its final elevation before the track is placed in service.
C. When raising track, use approved device to maintain grade and proper cross level. Horizontal alignment must be maintained during the raising operation. Use of automated controls on tampers will satisfy this requirement.

D. Insulated Joints:

1. Factory assemble with adhesive bond and section of rail. Assemblies shall be tangent and properly identified with manufacturer's name, serial number, month and year of manufacture.

2. Apply bonding agent to ensure proper distribution throughout the contact area, rail and joint bar bolt holes and bolt thread. Distribute excess epoxy around joint bar, nut and thread to form an insulated layer.

3. Finish assembly so that no openings or exposures of insulation material or glass fiber remain which could permit penetration of moisture. Paint entire joint area with General Electric "Glyptal 120" insulating paint, or equal.

4. After assembly, perform electric Megohmmeter Test and insulation breakdown test (Hi-Pot); insulation shall resist the application of 500 VDC at 10 megohms for a duration of 5 seconds. Insulation shall resist application of 3,000 VAC at 60 Hz for a duration of 60 seconds.

5. Qualification Testing:

a. Test two completely assembled joints by the manufacturer. Utilize two 2 long rail sections for each joint. Saw each joint in half where the rails are butted together, perpendicular to the centerline of the top of the rail with a tolerance of plus or minus 1 degree and in a manner that prevents overheating and damage to the bonding agent. Utilize a testing device so that the reaction occurs only perpendicular to the sawed end of the joint bars when the load is applied parallel to the running surface of the rail, at the centroid of the rail, at the opposite end.

b. Apply loads in increments of 25,000 pounds, with the load maintained constant until the longitudinal deflection of the rail ceases, before increasing the load to the next increment. Record the load and differential movement of the rail and joint bars, measured to 0.001 inch, at each increment. Increase the load in increments until a total load of 650,000 pounds is attained.

c. Longitudinal compression test acceptance criteria: Joint shall not show any slippage during or before the total load is applied. At completion of the test and after the load is removed, the relative position of the rail and joint bar shall be within 0.01 inch of the original value.

3.6 RAIL ENDS

A. Cut rail with rail saw to a tolerance of 1/32 inch from square. Remove burrs and make ends smooth. Torch cut rails will be rejected.
3.7 PROCEDURES FOR PLACEMENT OF CWR

A. Rail temperature shall not be less than 100 degrees Fahrenheit at the time of fastening.

B. Fill tie cribs with ballast immediately after laying rails and after each track raise. Track shall be surfaced and lined and all ties tamped, prior to returning track to service.

C. When installing rail at a temperature lower than 100 degrees Fahrenheit, heat rail with a heating device approved by the Railroad.

D. If rail temperature exceeds 130 degrees Fahrenheit, Railroad reserves the right to suspend rail laying operations, or direct that the rail be cooled.

E. Position welded rails for installing in a manner to minimize handling and prevent buckling.

F. Place rails base down, parallel with track, avoiding excessive bending or damage, using suitable mechanical equipment. Avoid placing rails on manhole covers, electrical connections or near any other installation that could be susceptible to damage.

G. In advance of the rail fastening, use approved rail thermometer to determine rail temperature. Place on web or base of rail shaded from the sun, long enough to record the rail temperature accurately. The temperature shall be checked frequently. All rail thermometers shall be checked for accuracy.

H. Tools used for field cutting rails shall be approved rail saws or abrasive cutting wheels. Cutting torches shall not be used on rail.

3.8 ANCHORING CWR

A. Install rail anchoring devices or elastic fasteners when the rail is within the permissible anchoring temperature. Anchor opposite rail only when its temperature is within 5 degrees Fahrenheit of the previously anchored rail's temperature at the time of its anchoring.

B. Prior to joining CWR strings, adjust the CWR strings for the zero thermal stress temperature, vibrate to relieve internal rail stresses, and fully anchor or fasten.

3.9 ADJUSTMENT BY MECHANICAL HEATING

A. Adjust rail for temperature after it has been laid on tie plates but before it is anchored or fastened.

B. Provide space at the end of each continuous welded rail equal to the amount of the expansion that is required for that rail.
C. Heating shall begin at the end of the rail and steadily applied moving forward without reversing direction until the required expansion has been obtained for that rail.

D. Complete anchoring or fastening application shall follow heating as closely as possible. Any deviation or delay will require reheating the rail.

3.10 ADJUSTMENT BY NATURAL TEMPERATURE CHANGE

A. When it is necessary to adjust the rail already in track, determine the required increase or decrease by taking the difference between measured and recorded rail temperatures at each string of CWR and calculating the amount of adjustment, as specified herein.

B. Calculate the adjustment for a temperature higher or lower than that at which it was anchored or adjusted, by taking the difference between the two temperatures, multiplying that difference in degrees Fahrenheit by the length of the rail in feet, and multiplying the product by 0.000078.

<table>
<thead>
<tr>
<th>Rail Temperature</th>
<th>Inches of Increase for 600 foot of Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4.7</td>
</tr>
<tr>
<td>10</td>
<td>4.2</td>
</tr>
<tr>
<td>20</td>
<td>3.7</td>
</tr>
<tr>
<td>30</td>
<td>3.3</td>
</tr>
<tr>
<td>40</td>
<td>2.8</td>
</tr>
<tr>
<td>50</td>
<td>2.3</td>
</tr>
<tr>
<td>60</td>
<td>1.9</td>
</tr>
<tr>
<td>70</td>
<td>1.4</td>
</tr>
<tr>
<td>80</td>
<td>0.9</td>
</tr>
<tr>
<td>90</td>
<td>0.5</td>
</tr>
<tr>
<td>100</td>
<td>0.0</td>
</tr>
<tr>
<td>Higher</td>
<td>0.0</td>
</tr>
</tbody>
</table>

3.11 RAIL ANCHORAGE RECORD

A. Provide in an acceptable, reproducible form, containing the following data for each end of a CWR and at each 500 foot interval during installation:

1. Date and time.
2. Track number and rail (East or West, North or South).
3. Station location.
4. Weather, air, and base of rail temperature.
5. Type of fastener.
6. Length of rail being anchored.

3.12 TRACK CRITERIA AND TOLERANCES

A. Construct to the alignment and grade prescribed. Gage shall be 4 feet 8-1/2 inches,
meeting following tolerances as well as standards for FRA class 1 track.

1. Deviation from correct gage: ±3/32 inch

2. Track Surface: Tolerance
   a. Runoff in any 31 feet of rail at the end of a raise may not be more than: ½ inch
   b. Deviation from uniform profile on either rail at the mid-ordinate of a 62-foot chord may not be more than: 1/2 inch
   c. Deviation from zero cross level at point on tangent may not be more than: 1/2 inch
   d. Variation in cross level between two points less than 62 feet apart on tangents may not be more than: 1/2 inch

3. Alignment: Maximum deviation from uniformity measured in conformance with FRA Safety Standards Section 213.55.
   a. Tangent Track: 3/8 inch at mid offset on a 62 foot chord.
   b. Curved Track: 3/8 inch from correct mid-ordinate on a 62 foot chord.

3.13 TRACK REALIGNMENT
   A. Realign track as indicated on the contract drawings.

3.14 FIELD WELDING
   A. For thermite welding, methods and procedures: Comply with the AREMA Manual, Chapter 4, specification for "Thermite Welding-Rail Joints-1980," and with the welding kit manufacturer's recommendations and as specified herein.
   B. Prepare rail ends for thermite welding in accordance with the recommendations of the welding kit manufacturer.
   C. For thermite welding, preheat the rail ends prior to welding to a sufficient temperature and for sufficient time to ensure full fusion of the weld metal to the rail ends without cracking of the rail or weld.
   D. The completed weld shall be finished by mechanically controlled grinding to conform to the same requirements specified for shop welding.
   E. Welds shall not be made within 6 inches of bolt holes, or pin holes, or within 3 feet of plant weld.
   F. Follow manufacturer's recommendations for compromise welds.
   G. Follow recommendations of rail manufacturer for welding heat treated or high strength rails.
   H. Welds must be in cribs between ties and located no closer than 4 inches to nearest tie.
I. Rail shall be painted in legible characters at least 1-1/2 inches high at each field weld with the following information:

1. Date of Weld (MO/DAY/YR).
2. Initials of welder performing weld.
3. Air temperature at time of weld (AT XXX).
4. Rail temperature at time of weld (RT XXX).
5. Adjusted rail temperature, if rail is pulled to achieve thermal adjustment.

3.15 TOLERANCES OF FIELD WELDS

A. Measure with a straight edge 36 inches in length, applied to finished welded joint area, showing the following maximum variations:

1. Rail Head:
   a. Vertical Offset 0.020 inches
   b. Horizontal Offset 0.040 inches
   c. Vertical Crown 0.030 - 0.045 inches
   d. Horizontal Kink 0.020 inches

2. Rail Base:
   a. Horizontal Offset 0.060 inches
   b. Offset Bending 0.010 per inch

3.16 FIELD WELD TESTING

A. Test every weld by a testing agency using the Ultrasonic testing method in accordance with ASTM E164.

B. Each completed weld shall have a full penetration and complete fusion and be entirely free of cracks. Total area of internal defects such as porosity and slag inclusions shall not exceed 0.060 square inches and the largest single porosity or slag defect permitted shall not exceed 1/8" in diameter.

C. Other causes for rejection of welds:

1. Cracks that show in the finished weld.
2. Pit holes that show in web and base of weld after finish grinding. Pit holes in head not exceeding 1/4 inch in depth may if approved by the Railroad, be repaired by gas welding.

D. Cut out defective welds and insert a new section of rail not less than 18 feet long; weld and retest.

3.17 FINISHING OF FIELD WELDS

A. Remove sharp edges and burrs by grinding, including chimneys from welds.
B. Weld joints shall be ground smooth on top and sides of ball and straight in line. No overgrinding is permitted.

C. Weld joints shall be ground rounded and smooth on web and top of base. Offset blending permitted at rate of 0.010 per inch.

3.18 CUTTING IN SHORT SECTION RAIL AND THERMITE WELDING ENDS

A. When directed by the Railroad, for the following reasons:

1. To repair defective rail.
2. To repair defective weld.
3. To de-stress rail.
4. To make a connection between rail strings or adjust rail to meet a specific point (i.e. to connect CWR to stock rail or frog).
5. To install sections of rail that contains insulated joints.

B. The short section of rail to be cut in shall be at least 18 feet long and of the same weight, size, section, and class of rail being replaced or joined.

C. Before cutting out rail in CWR, prevent remaining CWR from further movement by applying anchors. After cutting CWR, use rail expander/puller or other means to prevent rail movement.

D. The ends of the short rail section and the CWR shall be sawed or abrasive cut.

E. Follow procedures specified for completing field welding by thermite process.

F. When repairing defective rail or weld, new rail shall be the same length as rail being replaced.

3.19 FINAL TESTING

A. Railroad will perform final testing of the trackwork installation with a geometric test car and with ultrasonic weld inspection equipment.

END OF SECTION 341113.23
SECTION 341126.13 - BALLAST

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. This section includes the requirements for track ballast.

B. Related Work Specified Elsewhere:

1. Division 34 Section "Subballast"
2. Division 34 Section "Trackwork"

1.3 QUALITY ASSURANCE

A. Codes, Regulations, Reference Standards and Specifications:


   b. D751, Method of Testing Coated Fabrics.

B. Noted Restrictions:

1. Do not stockpile material without written approval of the Railroad.
2. Minimize segregation of ballast.

1.4 SUBMITTALS

A. Samples of not less than 50 pounds with gradation test results.

B. Plan for handling and constructing ballast.

C. Specifications for compaction equipment.

D. Product data and sample.
PART 2 - PRODUCTS

2.1 MATERIALS

A. General Characteristics: Crushed trap, flint, or other rock approved by the Railroad, composed of angular fragments which are clear and free from deleterious substances, and of proper gradation.


1. The percentage passing each sieve within the following limits:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Sieve Opening</th>
<th>Percent Passing by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2.0”</td>
<td>100</td>
</tr>
<tr>
<td>1-1/2</td>
<td>1.50”</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>1.0”</td>
<td>90-100</td>
</tr>
<tr>
<td>3/4</td>
<td>0.75”</td>
<td>40-75</td>
</tr>
<tr>
<td>1/2</td>
<td>0.50</td>
<td>15-35</td>
</tr>
<tr>
<td>3/8</td>
<td>0.375”</td>
<td>0-5</td>
</tr>
</tbody>
</table>

2. Deleterious substances in ballast shall not be in excess of the following amounts:

<table>
<thead>
<tr>
<th>Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft and friable pieces 3.0</td>
</tr>
<tr>
<td>Materials finer than No. 200 sieve 0.5</td>
</tr>
<tr>
<td>Clay lumps 0.5</td>
</tr>
</tbody>
</table>

C. Hardness: At least 5.5 (average) as measured on Moh Hardness scale.

D. Water Absorption: Not exceeding 0.40 pounds per cubic foot.

E. Chemical Analysis: Reveal quantitatively that at least 70% of test sample is composed of silicon dioxide, aluminum oxide, and iron oxide, and that not more than 25% of the test sample is comprised of magnesium oxide, magnesium carbonate and calcium carbonate.

PART 3 - EXECUTION

3.1 PREPARATION

A. Transmit submittals and deliverables required by this Section.

B. Ensure substrates are in suitable condition to receive the work of this Section.

C. Furnish products as indicated.

3.2 INSTALLATION AND COMPACTION FOR TRACKWORK INSTALLATION
A. Place ballast over prepared subballast section in lifts not more than 8 inches thick before compaction. Before compaction, extend layers beyond the edge of the ties as indicated. Compact the ballast thoroughly to form a stable section able to support the subsequent layers and loads.

B. Compact ballast to 100% maximum density by vibratory compaction equipment specifically manufactured for compaction purposes, or self-propelled pneumatic-tired roller. Self-propelled, pneumatic-tired roller shall have a gross weight of 10 to 15 tons. Vibratory compactor shall have a weight of not less than 10 tons and be capable of applying a dynamic load of not less than 18,000 pounds at 1,300 to 1,500 cycles per minute. Proposed compaction equipment shall be approved by the Railroad.

C. Verify the compacted ballast prior to the installation of track and appurtenant work over the ballast. Uniformly spread and compact each lift of ballast within the initial layer with not less than four passes of either a self-propelled, pneumatic-tired roller or vibratory compactor.

D. Raise track in increments of not more than 3” and tamp making one full tamping insertion for each inch of raise.

E. Compact ballast in crib areas by means approved by Railroad, after ties are tamped.

F. Correct any deficiencies, including retamping cribs, redressing ballast sections, furnishing and installing additional ballast, as directed by the Railroad.

G. Keep ballast from touching the rails. Ballast in cribs must finish flush with top of ties, except in switch point area. In switch point areas half-fill cribs with ballast.

3.3 INSTALLATION OF BALLAST PAD

A. In areas where Amtrak force account will construct, relocate, or shift track, place compacted ballast pad over prepared subballast section to lines shown on the plans up to 2” below the bottom of the proposed ties. Place in lifts not greater than 6” before compaction. Compact the ballast pad thoroughly to form a stable section able to support the subsequent layers and loads.

B. Compact ballast to 100% maximum density by vibratory compaction equipment specifically manufactured for compaction purposes, or self-propelled pneumatic-tired roller. Self-propelled, pneumatic-tired roller shall have a gross weight of 10 to 15 tons. Vibratory compactor shall have a weight of not less than 10 tons and be capable of applying a dynamic load of not less than 18,000 pounds at 1,300 to 1,500 cycles per minute. Proposed compaction equipment shall be approved by the Railroad.

C. Verify the compacted ballast prior to the installation of track and appurtenant work over the ballast. Uniformly spread and compact each lift of ballast within the initial layer with not less than four passes of either a self-propelled, pneumatic-tired roller or vibratory compactor.
3.4 MAINTENANCE

A. Keep traffic off of ballast once it is placed and approved by the Railroad. Repair any portion of the ballast pad damaged by rutting of equipment.

END OF SECTION 341126.23
SECTION 341126.16 - SUBBALLAST

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 DESCRIPTION

A. The work specified in this section consists of approved aggregate placed on the subgrade and in close conformity with the lines, grades, shown on the plans or established by the Engineer.

B. Related Work Specified Elsewhere:

1. Division 31 Section “Earthmoving”

1.3 QUALITY ASSURANCE

A. Codes, Regulations, Reference Standards and Specifications:

1. American Society for Testing and Materials (ASTM)
   b. D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
   c. D 4253, Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

2. State of Illinois Department of Transportation, latest edition

1.4 SUBMITTALS

A. Submit the following for approval in accordance with Section 013300 and with the additional requirements as specified for each:

1. Certificates of compliance of materials for liquid limit, plasticity, and dry density. (Note: Engineer reserves the right to test materials for specification compliance.

2. Field Tests: Submit three copies of each field density, liquidity, plasticity, and gradation test within 24 hours after completion of testing.

1.5 JOB CONDITIONS

A. Prevent damage to pipes, conduits, wires, cables and structures above and below ground which are not designated for removal. Repair or replace damaged items to
the satisfaction of the affected agency at Contractor's sole expense.

B. Consider the safety of the work and that of people and property on and adjacent to the work site when determining equipment movement and use of materials and equipment on the work site. Comply with the safety requirements specified in the Contract Documents, including General Provisions and State and city safety and health ordinances.

C. Control and prevent the spread of dust and avoid creation of a nuisance in the surrounding area.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregate Subballast shall be well graded material conforming to the requirements ASTM D-1241-68, type 1, gradation A.

B. Aggregate meeting the requirements of IDOT Form M 41-10 Section 4-02.2 may be substituted for the above gradation.

PART 3 - EXECUTION

3.1 CONSTRUCTION METHODS

A. The construction methods shall be in accordance with IDOT Form M 41-01 Chapter 4. Subballast shall be compacted to not less than 98% of its dry weight density as determined by ASTM D 1557 or to 85% of its relative maximum density as determined by ASTM D 4253, whichever is higher.

B. Subballast section, depth, width, and slope shall conform to the typical sections and cross sections shown on the plans. The Contractor is responsible for setting and establishing the finish elevations and lines.

C. Contractor shall avoid damage to completed compacted subballast sections during subsequent operations. Rutting, mixture with foreign materials and disturbance of finished shoulders shall be repaired by the Contractor at his expense.

D. Any material which is placed and subsequently determined by the Engineer to be not in compliance with this Specification shall be removed and replaced by the Contractor at his expense.

END OF SECTION 341126.16
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. The work specified in this section includes the requirements for the construction of Highway-Railroad Grade Crossings, including obtaining all materials for the construction of the temporary grade crossings shown on the Contract Documents.

B. Related Work Specified Elsewhere:

1. Division 31 Section “Earthwork”
2. Division 34 Section “Trackwork”
3. Division 34 Section “Ballast”
4. Division 34 Section “Subballast”

1.3 QUALITY ASSURANCE

A. Codes, Regulations, Reference Standards and Specifications:

1.4 SUBMITTALS

A. Complete description of work including construction phasing with traffic control.

B. Product data, clearly marked to indicate item type and size for the following materials:

1. Rubber Panels.
2. Grade Crossing Ties.

PART 2 - PRODUCTS

2.1 RUBBER PANELS

A. Full depth, heavy duty, virgin rubber as manufactured by High Rail Corporation or approved equal.

2.2 ROAD MATERIALS

A. Conform to Division 32 Section “Asphaltic Paving.”
PART 3 - EXECUTION

3.1 PREPARATION

A. Transmit submittals and deliverables required by this Section.

B. Furnish products as indicated.

C. Ensure substrates are in suitable condition to receive the work of this section.

3.2 ROAD CROSSING CONSTRUCTION

A. No field welds will be permitted within the limits of the grade crossing new trackwork unless approved by the Railroad.

B. Construct track through grade crossing in accordance with Section “Trackwork”. Track shall be completed to finish line and grade, surfaced and the ballast compacted and dressed prior to installation of the crossing panel.

C. Excavate to 6 inches below subgrade elevation in accordance with Division 31 Section “Earth Moving”. Over excavate unsuitable subgrade if required per Division 31 Section “Earth Moving”. Compact subgrade under new track in accordance with Division 31 Section “Earth Moving”.

D. Pave flush with top of prefabricated grade crossing panels between the tracks and up to a distance of 12 feet from the centerline of track on the sides, using the paving section shown.

END OF SECTION 341195