PROJECT MANUAL FOR:

MANCHESTER COMMUNITY COLLEGE
WELDING ADDITION
1066 Front Street
Manchester, New Hampshire

WARRENSTREET ARCHITECTS, INC.
27 WARREN STREET
CONCORD, NH  03301
(603) 225-0640  FAX (603) 225-0621

TFMORAN, INC.
48 CONSTITUTION DRIVE
BEDFORD, NH 03110
(603) 472-4488  FAX (603) 472-9747

YEATON ASSOCIATES, INC.
66 JACKSON STREET
LITTLETON, NH 03561
(603) 444-6578  FAX (603) 444-2364

WAI PROJECT NO.:  3043.1

DATE:  June 29, 2012

BID & CONSTRUCTION DOCUMENTS

Warrenstreet Architects
Thoughtful Planning  Innovative Design  Respectful Collaboration
SECTION 000111
TABLE OF CONTENTS

1. TABLE OF CONTENTS 5
2. NOTICE OF INVITATION 1
3. INVITATION TO BID 2
4. SECTION 21-1:81-a 1
5. PROPOSAL FORM LUMP SUM GRAND TOTAL BID 8
6. AIA A201 GENERAL CONDITIONS 53

INTRODUCTORY INFORMATION

000102  PROJECT INFORMATION 2
000115  LIST OF DRAWINGS 2
002113  INSTRUCTIONS TO BIDDERS 7

PROCUREMENT REQUIREMENTS

004000  PROCUREMENT FORMS AND SUPPLEMENTS 1

SUMMARY

001100  SUMMARY 2

PRICE AND PAYMENT PROCEDURES

012000  PRICE AND PAYMENT PROCEDURES 1
012100  ALLOWANCES 1
012300  ALTERNATES 1

ADMINISTRATIVE REQUIREMENTS

013000  ADMINISTRATIVE REQUIREMENTS 5
013216  CONSTRUCTION PROGRESS SCHEDULE 1

QUALITY REQUIREMENTS

014000  QUALITY REQUIREMENTS 3
014533  CODE-REQUIRED SPECIAL INSPECTIONS 3

TEMPORARY FACILITIES AND CONTROLS

015000  TEMPORARY FACILITIES AND CONTROLS 2
015100  TEMPORARY UTILITIES 1
015213  FIELD OFFICES AND SHEDS 1
015500  VEHICULAR ACCESS AND PARKING 1
015721  INDOOR AIR QUALITY CONTROLS 2

TABLE OF CONTENTS 000000 - 1
## PRODUCT REQUIREMENTS

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>016000</td>
<td>PRODUCT REQUIREMENTS</td>
<td>3</td>
</tr>
<tr>
<td>016116</td>
<td>VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS</td>
<td>2</td>
</tr>
</tbody>
</table>

## EXECUTION AND CLOSEOUT

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>017000</td>
<td>EXECUTION AND CLOSEOUT REQUIREMENTS</td>
<td>7</td>
</tr>
<tr>
<td>017419</td>
<td>CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL</td>
<td>4</td>
</tr>
<tr>
<td>017800</td>
<td>CLOSEOUT SUBMITTALS</td>
<td>1</td>
</tr>
</tbody>
</table>

## DIVISION 02 – EXISTING CONDITIONS

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>024100</td>
<td>DEMOLITION</td>
<td>1</td>
</tr>
</tbody>
</table>

## DIVISION 03 – CONCRETE

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>033000</td>
<td>CAST-IN-PLACE CONCRETE</td>
<td>8</td>
</tr>
<tr>
<td>033511</td>
<td>CONCRETE FLOOR FINISHES</td>
<td>2</td>
</tr>
<tr>
<td>033053</td>
<td>MISCELLANEOUS CAST-IN-PLACE CONCRETE</td>
<td>7</td>
</tr>
</tbody>
</table>

## DIVISION 05 – METALS

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>051200</td>
<td>STRUCTURAL STEEL FRAMING</td>
<td>11</td>
</tr>
<tr>
<td>052100</td>
<td>STEEL JOIST FRAMING</td>
<td>7</td>
</tr>
<tr>
<td>053100</td>
<td>STEEL DECKING</td>
<td>7</td>
</tr>
<tr>
<td>055100</td>
<td>METAL STAIRS</td>
<td>3</td>
</tr>
<tr>
<td>055213</td>
<td>PIPE AND TUBE RAILINGS</td>
<td>5</td>
</tr>
</tbody>
</table>

## DIVISION 06 – WOODS, PLASTICS AND COMPOSITES

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>061000</td>
<td>ROUGH CARPENTRY</td>
<td>1</td>
</tr>
</tbody>
</table>

## DIVISION 07 – THERMAL AND MOISTURE PROTECTION

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>074214</td>
<td>INSULATED METAL WALL PANELS</td>
<td>3</td>
</tr>
<tr>
<td>074646</td>
<td>FIBER CEMENT SIDING</td>
<td>3</td>
</tr>
<tr>
<td>075400</td>
<td>THERMOPLASTIC MEMBRANE ROOFING</td>
<td>6</td>
</tr>
<tr>
<td>077100</td>
<td>ROOF SPECIALTIES</td>
<td>2</td>
</tr>
<tr>
<td>077200</td>
<td>ROOF ACCESSORIES</td>
<td>3</td>
</tr>
<tr>
<td>079005</td>
<td>JOINT SEALERS</td>
<td>3</td>
</tr>
</tbody>
</table>

## DIVISION 08 - OPENINGS

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>081113</td>
<td>HOLLOW METAL DOORS AND FRAMES</td>
<td>4</td>
</tr>
<tr>
<td>083613</td>
<td>SECTIONAL DOORS</td>
<td>3</td>
</tr>
<tr>
<td>086200</td>
<td>UNIT SKYLIGHTS</td>
<td>2</td>
</tr>
<tr>
<td>087100</td>
<td>DOOR HARDWARE</td>
<td>6</td>
</tr>
<tr>
<td>088000</td>
<td>GLAZING</td>
<td>3</td>
</tr>
</tbody>
</table>
### DIVISION 09 - FINISHES

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>099000</td>
<td>PAINTING AND COATING</td>
<td>6</td>
</tr>
</tbody>
</table>

### DIVISION 10 – SPECIALTIES

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>101426</td>
<td>POST AND PANEL SIGNAGE</td>
<td>4</td>
</tr>
<tr>
<td>104400</td>
<td>FIRE PROTECTION SPECIALTIES</td>
<td>2</td>
</tr>
</tbody>
</table>

### DIVISION 21 – FIRE SUPPRESSION

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>210000</td>
<td>FIRE SUPPRESSION</td>
<td>2</td>
</tr>
<tr>
<td>210100</td>
<td>OPERATION AND MAINTENANCE OF FIRE SUPPRESSION</td>
<td>2</td>
</tr>
<tr>
<td>210500</td>
<td>COMMON WORK RESULTS FOR FIRE SUPPRESSION</td>
<td>1</td>
</tr>
<tr>
<td>210600</td>
<td>SCHEDULE FOR FIRE SUPPRESSION</td>
<td>1</td>
</tr>
<tr>
<td>210800</td>
<td>COMMISSIONING OF FIRE SUPPRESSION</td>
<td>1</td>
</tr>
<tr>
<td>211000</td>
<td>WATER-BASED FIRE-SUPPRESSION SYSTEMS</td>
<td>1</td>
</tr>
<tr>
<td>211100</td>
<td>FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING</td>
<td>2</td>
</tr>
</tbody>
</table>

### DIVISION 22 – PLUMBING

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>220000</td>
<td>PLUMBING</td>
<td>2</td>
</tr>
<tr>
<td>220100</td>
<td>OPERATION AND MAINTENANCE OF PLUMBING</td>
<td>4</td>
</tr>
<tr>
<td>220500</td>
<td>COMMON WORK RESULTS FOR PLUMBING</td>
<td>1</td>
</tr>
<tr>
<td>220523</td>
<td>GENERAL-DUTY VALVES FOR PLUMBING PIPING</td>
<td>1</td>
</tr>
<tr>
<td>220529</td>
<td>HANGERS AND SUPPORTS FOR PLUMBING PIPING AND</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>EQUIPMENT</td>
<td></td>
</tr>
<tr>
<td>220548</td>
<td>VIBRATION AND SEISMIC CONTROL FOR PLUMBING</td>
<td>1</td>
</tr>
<tr>
<td>220553</td>
<td>IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT</td>
<td>2</td>
</tr>
<tr>
<td>220610</td>
<td>SCHEDULES FOR PLUMBING PIPING AND PUMPS</td>
<td>4</td>
</tr>
<tr>
<td>220640</td>
<td>SCHEDULES FOR PLUMBING FIXTURES</td>
<td>1</td>
</tr>
<tr>
<td>220700</td>
<td>PLUMBING INSULATION</td>
<td>1</td>
</tr>
<tr>
<td>220800</td>
<td>COMMISSIONING OF PLUMBING</td>
<td>2</td>
</tr>
<tr>
<td>221113</td>
<td>FACILITY WATER DISTRIBUTION PIPING</td>
<td>8</td>
</tr>
<tr>
<td>221313</td>
<td>FACILITY SANITARY SEWERS</td>
<td>6</td>
</tr>
<tr>
<td>224000</td>
<td>PLUMBING FIXTURES</td>
<td>1</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>230000</td>
<td>HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)</td>
<td>2</td>
</tr>
<tr>
<td>230100</td>
<td>OPERATION AND MAINTENANCE OF HVAC SYSTEMS</td>
<td>2</td>
</tr>
<tr>
<td>230500</td>
<td>COMMON WORK RESULTS FOR HVAC</td>
<td>1</td>
</tr>
<tr>
<td>230516</td>
<td>EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING</td>
<td>1</td>
</tr>
<tr>
<td>230523</td>
<td>GENERAL-DUTY VALVES FOR HVAC PIPING</td>
<td>2</td>
</tr>
<tr>
<td>230529</td>
<td>HANGERS AND SUPPORTS FOR HVAC PIPING AND</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>EQUIPMENT</td>
<td></td>
</tr>
<tr>
<td>230548</td>
<td>VIBRATION ISOLATION AND SEISMIC CONTROLS FOR HVAC</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>PIPING AND EQUIPMENT</td>
<td></td>
</tr>
<tr>
<td>230553</td>
<td>IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT</td>
<td>2</td>
</tr>
<tr>
<td>230593</td>
<td>TESTING, ADJUSTING, AND BALANCING FOR HVAC</td>
<td>2</td>
</tr>
</tbody>
</table>
### DIVISION 25 – INTEGRATION AUTOMATION

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>250000</td>
<td>INTEGRATED AUTOMATION</td>
<td>2</td>
</tr>
<tr>
<td>250100</td>
<td>OPERATION AND MAINTENANCE OF INTEGRATED AUTOMATION</td>
<td>1</td>
</tr>
<tr>
<td>250800</td>
<td>COMMISSIONING OF INTEGRATION AUTOMATION</td>
<td>2</td>
</tr>
<tr>
<td>251000</td>
<td>INTEGRATED AUTOMATION NETWORK EQUIPMENT</td>
<td>6</td>
</tr>
<tr>
<td>259000</td>
<td>INTEGRATED AUTOMATION CONTROL SEQUENCES</td>
<td>2</td>
</tr>
</tbody>
</table>

### DIVISION 26 – ELECTRICAL

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>260000</td>
<td>ELECTRICAL GENERAL PROVISIONS</td>
<td>3</td>
</tr>
<tr>
<td>260519</td>
<td>LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES</td>
<td>4</td>
</tr>
<tr>
<td>260523</td>
<td>CONTROL-VOLTAGE ELECTRICAL POWER CABLES</td>
<td>4</td>
</tr>
<tr>
<td>260526</td>
<td>GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS</td>
<td>3</td>
</tr>
<tr>
<td>260529</td>
<td>HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS</td>
<td>4</td>
</tr>
<tr>
<td>260533</td>
<td>RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS</td>
<td>7</td>
</tr>
<tr>
<td>260548</td>
<td>VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS</td>
<td>3</td>
</tr>
<tr>
<td>260553</td>
<td>IDENTIFICATION FOR ELECTRICAL SYSTEMS</td>
<td>5</td>
</tr>
<tr>
<td>260573</td>
<td>OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY</td>
<td>6</td>
</tr>
<tr>
<td>260923</td>
<td>LIGHTING CONTROL DEVICES</td>
<td>4</td>
</tr>
<tr>
<td>260943</td>
<td>RELAY-BASED LIGHTING CONTROLS</td>
<td>7</td>
</tr>
<tr>
<td>262200</td>
<td>LOW-VOLTAGE TRANSFORMERS</td>
<td>5</td>
</tr>
<tr>
<td>262416</td>
<td>PANELBOARDS</td>
<td>6</td>
</tr>
<tr>
<td>262726</td>
<td>WIRING DEVICES</td>
<td>5</td>
</tr>
<tr>
<td>262813</td>
<td>FUSES</td>
<td>3</td>
</tr>
<tr>
<td>262816</td>
<td>ENCLOSED SWITCHES AND CIRCUIT BREAKERS</td>
<td>5</td>
</tr>
<tr>
<td>265100</td>
<td>INTERIOR LIGHTING</td>
<td>7</td>
</tr>
</tbody>
</table>

### DIVISION 27 – COMMUNICATIONS

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>271500</td>
<td>COMMUNICATIONS HORIZONTAL CABLELING</td>
<td>6</td>
</tr>
</tbody>
</table>

**TABLE OF CONTENTS** 000000 - 4
## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Division</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIVISION 28 – FIRE ALARM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>283111</td>
<td>DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM</td>
<td>7</td>
</tr>
<tr>
<td><strong>DIVISION 31 – EARTHWORK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>311000</td>
<td>SITE CLEARING</td>
<td>4</td>
</tr>
<tr>
<td>312000</td>
<td>EARTH MOVING</td>
<td>9</td>
</tr>
<tr>
<td>312319</td>
<td>DEWATERING</td>
<td>3</td>
</tr>
<tr>
<td>312513</td>
<td>EROSION CONTROL</td>
<td>5</td>
</tr>
<tr>
<td><strong>DIVISION 32 – EXTERIOR IMPROVEMENTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>321216</td>
<td>ASPHALT PAVING</td>
<td>6</td>
</tr>
<tr>
<td>323113</td>
<td>CHAIN-LINK FENCES AND GATES</td>
<td>5</td>
</tr>
<tr>
<td>323223</td>
<td>SEGMENTAL RETAINING WALL</td>
<td>6</td>
</tr>
<tr>
<td>329200</td>
<td>TURF AND GRASSES</td>
<td>7</td>
</tr>
<tr>
<td><strong>DIVISION 33 – UTILITIES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>334100</td>
<td>STORM UTILITY DRAINAGE PIPING</td>
<td>10</td>
</tr>
<tr>
<td>337119</td>
<td>ELECTRICAL UNDERGROUND DUCTS</td>
<td>7</td>
</tr>
</tbody>
</table>
NOTICE OF INVITATION TO BID FOR GENERAL CONTRACTORS

This is a revision to a previously posted notice for this project. Please note date changes.

Manchester Community College (MCC), 1066 Front Street, Manchester, New Hampshire 03302, will be soliciting Sealed Bids for the construction of a 4,000 SF Addition that will expand the existing Welding Department. Project number MC 12-07. The budget for this project is under $1 million.

Plans and specifications prepared by Warrenstreet Architects and an invitation to bid will be made available on: July 2, 2012.

Bids will be due no later than 2:00 PM on Friday July 20th, 2012, with construction expected to start immediately.

All individuals, firms, partnerships or corporations submitting a bid must file with the Department of Transportation on forms prepared for that purpose prior to opening of bids. The General Contractor must provide proof of NH-DOT certification with their bid.

Prior to contract signing, the successful bidder shall be required to furnish a Performance Bond and Payment Bond, in the amount of one hundred percent (100%) of the bid submitted.
INVITATION TO BID – CCSNH

Sealed proposals will be accepted at the MANCHESTER COMMUNITY COLLEGE, 1066 Front Street, Manchester, NH 03102, Attention Sarah Diversi, Chief Financial Officer until 2:00 PM, prevailing time, on Friday, July 20th, 2012 for the following project:

MANCHESTER COMMUNITY COLLEGE
WELDING LAB ADDITION

MANCHESTER, NEW HAMPSHIRE 03102
Project # MC 12-07

Description: This project consists of construction of a new welding lab addition at the East side of the existing welding lab at Manchester Community College. Project includes:

1. Construction of a 4,000 SF Addition that will expand the existing Welding Department.
2. Associated sitework, drainage, lighting, and landscaping improvements.

The Project will include but not be limited to the Disciplines of: Site Construction, Concrete, Structural and Fabricated Metals, Insulated Metal Wall Panels, Roofing and Flashing, Finishes, Sprinkler, Plumbing, HVAC and Electrical Systems, etc.

Plans and specifications will be available from the Community College System of New Hampshire, July 2, 2012.

Plans and specifications are available at the following printers:

- Signature Press and Blueprinting, Inc., 45 Londonderry Turnpike, Rte. 28 Bypass, Hooksett, NH 03106;
- Reed Construction Data, 30 Technology Parkway South Suite 100 Norcross GA., 30092
- Construction Summary of NH: Inc., 734 Chestnut Street, Manchester, NH 03104;
- Infinite Imaging: 933 Islington Street, Portsmouth, NH 03801
- McGraw-Hill Construction, Dodge Plan Room: 880 Second Street, Manchester, NH 03102;
- Minuteman Press: 109 Gosling Road, Newington, NH 03801;
- Works in Progress, 20 Farrell Street, Suite 103, South Burlington, VT 05403
- Community College System of New Hampshire website
  http://www.cssnh.edu/capitalimprovements/index.html

BIDDERS SHOULD ACT PROMPTLY AND SUBMIT ALL QUESTIONS IN WRITING TO Matt Moore, FAX 603/219-0141, E-MAIL memoore@cssnh.edu IN ACCORDANCE WITH “EXPLANATION TO BIDDERS” – INSTRUCTIONS TO BIDDERS, DOCUMENT 00204 – PART 7.

A NON-MANDATORY SITE WALK WILL BE HELD TUESDAY JULY 10, 2012 AT 10:00.

BIDDERS ARE TO MEET AT THE FRONT LAWN CABANA NEAR THE MAIN ENTRANCE.
Project a substantial completion date is **January 30, 2013.**

Proposals must be completed in both words and figures on forms furnished by the College, or on previously-approved, substantially-identical forms generated by computer software, which shall be submitted in a sealed envelope marked: Proposal for: "Manchester Community College –Welding Lab Addition MC 12-07,” received by the College as specified no later than the date and time mentioned above.

All individuals, firms, partnerships or corporations intending to bid, before obtaining plans, specifications, and proposal forms, must have on file with the Department of Transportation forms prepared for that purpose at least eight (8) days prior to opening of bids, a statement showing their qualifications. No valid bidding proposal will be issued to a prospective bidder who is not qualified.

Companies, corporations or trade names, except sole proprietorships must be registered with the Secretary of State (Corporate Division, Telephone No. 603/271-3244) in order to do business with the State of New Hampshire.

Bidders must submit a 5% bid security at Bid and must furnish a 100% payment and performance security prior to execution of contract.

The right is reserved to waive any informalities in or to reject any or all proposals.

---

Matt Moore, PE,
Director of Capital Projects
Community College System of New Hampshire

June 29, 2012

KSM

END OF DOCUMENT
TITLE I
THE STATE AND ITS GOVERNMENT

CHAPTER 21-I
DEPARTMENT OF ADMINISTRATIVE SERVICES

Public Works Design and Construction

Section 21-I:81-a

21-I:81-a Requirement for Listing Subcontractor Bids for State Construction Contracts. – The following requirements apply to the construction, reconstruction, installation, demolition, maintenance, or repair of any building by a state agency, including the community college system and university system of New Hampshire, that is required to be awarded through competitive bidding.

I. A general contractor shall provide to the awarding state agency, community college, or university system a list of the names, addresses, CEO, CFO, other LLC principals, and each subcontractor to be used in the performance of the contract as soon as is practicable after the contract award, but in any event prior to the date on which the subcontractor begins work on the project. This provision applies to all subcontractors engaged to work on the project, regardless of the date of their engagement.

II. This section provides minimum disclosure standards regarding subcontractors and shall not preclude an awarding state agency or the community college or university system from setting more rigorous standards for construction work under their jurisdiction.

PROPOSAL FORM – LUMP SUM GRAND TOTAL BID

MANCHESTER COMMUNITY COLLEGE

WELDING LAB ADDITION
MCC PROJECT # MC 12-07

MANCHESTER, NEW HAMPSHIRE

1066 FRONT STREET, 03102
JUNE 29, 2012

NAME OF BIDDING CONTRACTOR

LUMP SUM GRAND TOTAL

THE COLLEGE SYSTEM RESERVES THE RIGHT TO AWARD ANY OR ALL ITEMS.
PROPOSAL FORM

Proposal of: ________________________________

Address: __________________________________

To furnish all materials and to do and perform work in accordance with the plans and specifications, on which proposals shall be submitted in a sealed envelope marked: Proposal for: “Manchester Community College Welding Lab Addition” and delivered to the Manchester Community College – Office of the Chief Financial Officer, 1066 Front St, Manchester, NH 03102 2:00 P.M., Prevailing Time, on Friday July 20, 2012 for the following project:

MANCHESTER COMMUNITY COLLEGE

WELDING LAB ADDITION,
1066 FRONT STREET
MANCHESTER, NH 03102

Delivery of Proposal: Proposal shall be placed in sealed envelope plainly marked to indicate its contents and addressed to the College at the address shown on the Invitation to Bids. Sealed Proposals shall be received and deposited in the Bid Box at the location specified prior to the time and as specified. Proposals delivered to the College by alternate means are submitted at the sole risk of the Bidder. The College will not accept responsibility for any reason if the Proposal is not deposited in the Bid Box by the specified time and date. Proposals received after the time for opening of bids will be returned to the bidder unopened.

President, Susan Huard
Manchester Community College
1066 Front St
Manchester, New Hampshire, 03102

Dear President:

In accordance with the advertisement of the College inviting proposals for the project herein before named, and in conformity with the plans and specifications on file in the offices of the College, I/WE hereby certify that I AM/WE ARE the only person or persons, interested in this proposal as principals; that this proposal is made without collusion with any person, firm or corporation, that an examination has been made of the plans and specifications and of the site of the work, and proposed to furnish all necessary machinery, equipment, tools and labor, and to furnish all materials specified in the manner and at the time prescribed at the following prices:
**ITEMS AND UNITS TABLE**

Rules of Prices Note: This Proposal shall be filled in by the Bidder, with the Prices written in both words and numerals, and the extensions will be made by him in the spaces provided. All bidders are to include ALL items. Grand total is too include all the scope for all the projects.

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>APPROXIMATE QUANTITIES AND UNIT TYPE</th>
<th>ITEMS AND UNITS PRICES BIDDED DOLLARS CENTS (numerical)</th>
<th>COST PER UNIT DOLLARS CENTS (numerical)</th>
<th>ITEM SUBTOTAL DOLLARS CENTS (numerical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 EACH</td>
<td>ITEM #1 - AL WIRK DESCRIBED IN WARREN STREET CONTRACT DOCUMENTS TO PROVIDE AN ADDITION TO THE MANCHESTER COMMUNITY COLLEGE WELDING LAB. (COST PER EACH WRITTEN)</td>
<td>.</td>
<td>$.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DOLLARS</td>
<td>1 PER EACH</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PER EACH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1 EACH</td>
<td>ITEM #2 - ALLOWANCE FOR UNFORESEEN CONDITIONS (COST PER EACH WRITTEN)</td>
<td>.</td>
<td>$25,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWENTY FIVE THOUSAND DOLLARS</td>
<td>1 PER EACH</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PER EACH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

THE LUMP SUM GRAND TOTAL FOR THIS PROJECT IS: (SUM OF ITEM SUBTOTALS OF ITEMS #1 and #2. In numbers: [______________]).

LUMP SUM GRAND TOTAL IN WORDS:
LUMP SUM GRAND TOTAL MUST ALSO BE ENTERED ON THE COVER PAGE OF THE PROPOSAL.

The award of contract shall be made to the lowest responsible bidder on the basis of the Lump Sum Grand Total.

The Chancellor reserves the right to waive any and all informalities in the best interests of the College.

It is further proposed:

To execute the form of contract and to complete the project on or before January 30, 2013 and in accordance with agreed to extensions based on weather conditions.

To furnish a contract bond in the amount of one hundred percent (100%) of the contract award as security for the completion of the contract in accordance with the plans and specifications and contract documents. The form of bond shall be that provided for by the Department, and the surety shall be acceptable to the Chancellor.

To guarantee all of the work performed under this contract to be done in accordance with the plans and specifications and the contract documents.

Enclosed, herewith, find cashier’s check, certified check, or bid bond in the amount of 5% of the total amount of the Lump Sum Price made payable to the “Treasurer, State of New Hampshire”, as a proposal guaranty, which it is understood, will be forfeited in the event the form of contract is not executed, if awarded to the undersigned.

The undersigned acknowledges receipt of the following addenda, issued during the bidding time, and states that these have been incorporated in this proposal:

Addendum No. dated

Proposal Form – Lump Sum Grand Total – MCCNH #12-07
00416 - 3
IF A PARTNERSHIP

Signature of Bidder: ________________________________

(printed name and title)

Partnership Name & Address

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

Names and Addresses of Members of the Partnership:

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________
IF AN LLC

Signature of Bidder: ____________________________

(printed name and title)

LLC Name & Address:

__________________________

__________________________

__________________________

Names and Addresses of Members and Managers:

__________________________

__________________________

__________________________

__________________________

__________________________
IF A CORPORATION

Signature of Bidder: ____________________________________________

Corporation Name & Address: ____________________________________________

(printed name and title)

Incorporated under the laws of the State of ______________________________

Bidder shall provide a Certificate of Good Standing or Registration from the NH Secretary of State’s Office indicating that the Bidder is authorized to conduct business in New Hampshire.

Names and Addresses of Corporate Officers: [A bid by a person who affixes to his/her signature, the word "President," "Secretary," "Agent" or other designation, without disclosing whom he/she is representing if other than the contracting entity noted above, may be held to the bid of the individual signing.]

President

Name: ____________________________________________

Address: ____________________________________________

Secretary

Name: ____________________________________________

Address: ____________________________________________

(Enter Designation of another Corporate Officer below, such as Vice President or Agent ...)

Name: ____________________________________________

Address: ____________________________________________

Proposal Form – Lump Sum Grand Total – MCCNH #12-07

00416 - 6
IF A PROPRIETORSHIP

Signature of Bidder: __________________________________________

(printed name and title)

Proprietorship Name & Address: __________________________________

If Applicable, a D/B/A or Trade Name: _________________________________

If Applicable, Certificate from Secretary of State’s Office to be attached.

END OF DOCUMENT
General Conditions of the Contract for Construction

the following PROJECT: MC 12-07
Manchester Community College – Student Center
Additions and Renovations to the Welding Lab
Relocation of Exercise Science
Computer Technology Classrooms
Temporary Kitchen

Master Owner Document SOREV 1-5-12:

THE OWNER:
Manchester Community College
1066 Front Street
Manchester, NH 03102

THE ARCHITECT:
Warren Street Architects
27 Warren Street
Concord, NH 03301

TABLE OF ARTICLES
1 GENERAL PROVISIONS
2 OWNER
3 CONTRACTOR
4 ARCHITECT
5 SUBCONTRACTORS
6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
7 CHANGES IN THE WORK
8 TIME
9 PAYMENTS AND COMPLETION
10 PROTECTION OF PERSONS AND PROPERTY
11 INSURANCE AND BONDS
12 UNCOVERING AND CORRECTION OF WORK
13 MISCELLANEOUS PROVISIONS
TERMINATION OR SUSPENSION OF THE CONTRACT

CLAIMS AND DISPUTES
INDEX
(Numbers and Topics in Bold are Section Headings)

Acceptance of Nonconforming Work
9.6.6, 9.9.3, 12.3
Acceptance of Work
9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3
Access to Work
3.16, 6.2.1, 12.1
Accident Prevention
10
Acts and Omissions
3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.4.2, 13.7.1, 14.1, 15.2
Addenda
1.1.1, 3.11.1
Additional Costs, Claims for
3.7.4, 3.7.5, 6.1.1, 7.3.7.5, 10.3, 15.1.4
Additional Inspections and Testing
9.4.2, 9.8.3, 12.2.1, 13.5
Additional Insured
11.1.4
Additional Time, Claims for
3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, 15.1.5
Administration of the Contract
3.1.3, 4.2.1, 9.4.9.5
Advertisement or Invitation to Bid
1.1.1
Aesthetic Effect
4.2.13
Allowances
3.8, 7.3.8
All-risk Insurance
11.3.1, 11.3.1.1
Applications for Payment
4.2.5, 7.3.9, 9.2, 9.3, 9.4, 9.5.1, 9.6.3, 9.7.1, 9.10, 11.1.3
Approvals
2.1.1, 2.2.2, 2.4, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10, 4.2.7, 9.3.2, 13.5.1
Arbitration
8.3.1, 11.3.10, 13.1.1, 15.3.2, 15.4
ARCHITECT
4
Architect, Definition of
4.1.1
Architect, Extent of Authority
2.4.1, 3.12.7, 4.1, 4.2, 5.2, 6.3.1, 7.1.2, 7.3.7, 7.4, 9.2.1, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.5.1, 13.5.2, 14.2.2, 14.2.4, 15.1.3, 15.2.1
Architect, Limitations of Authority and Responsibility
2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4.1, 9.4.2, 9.5.3, 9.6.4, 15.1.3, 15.2
Architect’s Additional Services and Expenses
2.4.1, 11.3.1.1, 12.2.1, 13.5.2, 13.5.3, 14.2.4
Architect’s Administration of the Contract
3.1.3, 4.2, 3.7.4, 15.2, 9.4.1, 9.5
Architect's Approvals
2.4.1, 3.1.3, 3.5.1, 3.10.2, 4.2.7
Architect’s Authority to Reject Work
3.5.1, 4.2.6, 12.1.2, 12.2.1
Architect’s Copyright
1.1.7, 1.5
Architect’s Decisions
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3.1, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2.1, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.5.2, 15.2, 15.3
Architect’s Inspections
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.5
Architect’s Instructions
3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.5.2
Architect’s Interpretations
4.2.11, 4.2.12
Architect’s Project Representative
4.2.10
Architect’s Relationship with Contractor
1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.1.3, 4.2.5, 6.2.2, 7.8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.4.2, 13.5, 15.2
Architect’s Relationship with Subcontractors
1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3.7
Architect’s Representations
9.4.2, 9.5.1, 9.10.1
Architect’s Site Visits
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5
Asbestos
10.3.1
Attorneys’ Fees
3.18.1, 9.10.2, 10.3.3
Award of Separate Contracts
6.1.1, 6.1.2
Award of Subcontracts and Other Contracts for Portions of the Work
5.2
Basic Definitions
1.1
Bidding Requirements
1.1.1, 5.2.1, 11.4.1
Binding Dispute Resolution
9.7.1, 11.3.9, 11.3.10, 13.1.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.4.1
Boiler and Machinery Insurance
11.3.2
Bonds, Lien
7.3.7.4, 9.10.2, 9.10.3
Bonds, Performance, and Payment
7.3.7.4, 9.6.7, 9.10.3, 11.3.9, 11.4
Building Permit
3.7.1
Capitilization
1.3
Certificate of Substantial Completion
9.8.3, 9.8.4, 9.8.5
Certificates for Payment
-4.2.1, 4.2.5, 4.2.9, 9.3.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7.1,
9.10.3, 11.3.1.3, 12.4.2, 15.1.3
Certificates of Inspection, Testing or Approval
13.5.4
Certificates of Insurance
9.10.2, 11.1.3
Change Orders
1.1.1, 2.4.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11.1, 3.12.8, 4.2.8,
5.2.3, 7.1.2, 7.1.3, 7.2, 7.3.2, 7.3.6, 7.3.9, 7.3.10,
8.3.1, 9.3.1, 9.9.10.3, 9.10.2, 11.3.1.2, 11.3.4, 11.3.9,
12.1.2, 15.1.3
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.1, 3.11, 4.2.8, 7, 7.2.1, 7.3.1, 7.4, 7.4.1, 8.3.1, 9.3.1.1, 11.3.9
Claims, Definition of
15.1.1
CLAIMS AND DISPUTES
3.2.4, 6.1.1, 6.3.1, 7.3.9, 9.3.3, 9.10.4, 10.3.3, 15,
15.4
Claims and Timely Assertion of Claims
15.4.1
Claims for Additional Cost
3.2.4, 3.7.4, 6.1.1, 7.3.9, 10.3.2, 15.1.4
Claims for Additional Time
3.2.4, 3.7.4, 6.1.1, 8.3.2, 10.3.2, 15.1.5
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1,
11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6
Claims Subject to Arbitration
15.3.1, 15.4.1
Cleaning Up
3.15, 6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3,
6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.3.1, 11.3.6, 11.4.1,
15.1.4
Commencement of the Work, Definition of
8.1.2
Communications Facilitating Contract
Administration
3.9.1, 4.2.4
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1,
9.10, 12.2, 13.7, 14.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3,
12.2, 13.7
Compliance with Laws
1.6.1, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4,
10.2.2, 11.1.1, 11.3.1, 13.1, 13.4, 13.5.1, 13.5.2, 13.6,
14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1,
9.10.2, 9.10.3, 11.3.1, 13.2, 13.4.2, 15.4.4.2
Consolidation or Joinder
15.4.4
CONSTRUCTION BY OWNER OR BY
SEPARATE CONTRACTORS
1.1.4, 6
Construction Change Directive, Definition of
7.3.1
Construction Change Directives
1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, 7.3,
9.3.1.1
Construction Schedules, Contractor's
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.3
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR
SUSPENSION OF THE
5.4.1.1, 11.3.9, 14
Contract Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating to
3.7.4, 3.10, 5.2, 6.1, 11.1.3, 11.3.6, 11.4.1
Contract Documents, The
1.1.1
Contract Documents, Copies Furnished and Use of
1.5.2, 2.2.5, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
3.7.4, 3.8, 5.2.3, 7.2, 7.3, 7.4, 9.1, 9.4.2, 9.5.1.4,
9.6.7, 9.7, 10.3.2, 11.3.1, 14.2.4, 14.3.2, 15.1.4,
15.2.5
Contract Sum, Definition of
9.1
Contract Time
3.7.4, 3.7.5, 3.10.2, 5.2.3, 7.2.1.3, 7.3.1, 7.3.5, 7.4, 8.1.1, 8.2.1, 8.3.1, 9.5.1, 9.7.1, 10.3.2, 12.1.1, 14.3.2, 15.1.5, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, 6.1.2
Contractor’s Construction Schedules
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2
Contractor’s Employees
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1,
Contractor’s Liability Insurance
11.1
Contractor’s Relationship with Separate Contractors and Owner’s Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3.7, 12.1.2, 12.2.4
Contractor’s Relationship with Subcontractors
1.2.2, 3.3.2, 3.18.1, 3.18.2, 5, 9.6.2, 9.6.7, 9.10.2, 11.3.1.2, 11.3.7, 11.3.8
Contractor’s Relationship with the Architect
1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.3, 4.2.5, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.5, 15.1.2, 15.2.1
Contractor’s Representations
3.2.1, 3.2.2, 3.5.1, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2
Contractor’s Responsibility for Those Performing the Work
3.3.2, 3.18.5.3.1, 6.1.3, 6.2, 9.5.1, 10.2.8
Contractor’s Review of Contract Documents
3.2
Contractor’s Right to Stop the Work
9.7
Contractor’s Right to Terminate the Contract
14.1, 15.1.6
Contractor’s Submittals
Contractor’s Superintendent
3.9, 10.2.6
Contractor’s Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.5, 7.3.7, 8.2, 10, 12, 14, 15.1.3
Contractual Liability Insurance
11.1.1.8, 11.2
Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1
Copies Furnished of Drawings and Specifications
1.5, 2.2.5, 3.11
Copyrights
1.5, 3.17
Correction of Work
2.3, 2.4, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, 12.2
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.7
Costs
2.4.1, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.7, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.3, 12.1.2, 12.2.1, 12.2.4, 13.5.14
Cutting and Patching
3.14, 6.2.5
Damage to Construction of Owner or Separate Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 11.1.1, 11.3, 12.2.4
Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4.1, 11.3.1, 12.2.4
Damages, Claims for
3.2.4, 3.18.6.1.3, 9.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6
Damages for Delay
6.1.1, 8.3.3, 9.5.1.6, 9.7, 10.3.2
Date of Commencement of the Work, Definition of
8.1.2
Date of Substantial Completion, Definition of
8.1.3
Day, Definition of
8.1.4
Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 15.2, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2.1, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.5.2, 14.2.2, 14.2.4, 15.1.1, 15.2
Decisions to Withhold Certification
9.4.1, 9.5, 9.7, 14.1.1.3
Defective or Nonconforming Work, Acceptance, Rejection and Correction of
2.3.1, 2.4.1, 3.5.1, 4.2.6, 6.2.5, 9.5.1, 9.5.2, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1
Defective Work, Definition of
3.5.1
Definitions
1.1, 2.1.1, 3.1.1, 3.5.1, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 15.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1
Delays and Extensions of Time
3.2, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4.1, 8.3, 9.5.1, 9.7.1, 10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5
Disputes
6.3.1, 7.3.9, 15.1, 15.2
Documents and Samples at the Site
3.11
Drawings, Definition of
1.1.5
Drawings and Specifications, Use and Ownership of
3.11
Effective Date of Insurance
8.2.2, 11.1.2
Emergencies
10.4, 14.1.1.2, 15.1.4
Employees, Contractor’s
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1
Insurance, Boiler and Machinery
11.3.2
Insurance, Contractor's Liability
11.1
Insurance, Effective Date of
8.2.2, 11.1.2
Insurance, Loss of Use
11.3.3
Insurance, Owner's Liability
11.2
Insurance, Property
10.2.5, 11.3
Insurance, Stored Materials
9.3.2, 11.4.1.4
INSURANCE AND BONDS
11
Insurance Companies, Consent to Partial Occupancy
9.9.1, 11.4.1.5
Insurance Companies, Settlement with
11.4.10
Intent of the Contract Documents
1.2.1, 4.2.7, 4.2.12, 4.2.13, 7.4
Interest
13.6
Interpretation
1.2.3, 1.4, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written
4.2.11, 4.2.12, 15.1.4
Judgment on Final Award
15.4.2
Labor and Materials, Equipment
1.1.3, 1.1.6, 3.4, 3.5.1, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,
4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3,
9.1.10, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Labor Disputes
8.3.1
Laws and Regulations
1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13.1, 4.1.1, 9.6.4, 9.9.1,
10.2.2, 11.1.1, 11.3, 13.1.1, 13.4, 13.5.1, 13.5.2,
13.6.1, 14, 15.2.8, 15.4
Liens
2.1.2, 9.3.3, 9.10.2, 9.10.4, 15.2.8
Limitations, Statutes of
12.2.5, 13.7, 15.4.1.1
Limitations of Liability
2.3.1, 3.2.2, 3.5.1, 3.12.10, 3.17.1, 3.18.1, 4.2.6,
4.2.7, 4.2.12, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 10.2.5, 10.3.3,
11.1.2, 11.2, 11.3.7, 12.2.5, 13.4.2
Limitations of Time
2.1.2, 2.2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7,
5.2, 5.3.1, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2.1, 9.3.1,
9.3.3, 9.4.1, 9.5, 9.6, 9.7.1, 9.8, 9.9, 9.10, 11.1.3,
11.3.1.5, 11.3.6, 11.3.10, 12.2, 13.5, 13.7, 14, 15
Loss of Use Insurance
11.3.3
Material Suppliers
1.5, 3.1.2.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.6, 9.10.5
Materials, Hazardous
10.2.4, 10.3
Materials, Labor, Equipment and
1.1.3, 1.1.6, 1.5.1, 3.4.1, 3.5.1, 3.8.2, 3.8.3, 3.12,
3.13.1, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2,
9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1,
14.2.1.2
Means, Methods, Techniques, Sequences and
Procedures of Construction
3.1.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2
Mechanic’s Lien
2.1.2, 15.2.8
Mediation
8.3.1, 10.3.5, 10.3.6, 15.2.1, 15.2.5, 15.2.6, 15.3,
15.4.1
Minor Changes in the Work
1.1.1, 3.12.8, 4.2.8, 7.1, 7.4
MISCELLANEOUS PROVISIONS
13
Modifications, Definition of
1.1.1
Modifications to the Contract
1.1.1, 1.1.2, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7.1,
10.3.2, 11.3.1
Mutual Responsibility
6.2
Nonconforming Work, Acceptance of
9.6.6, 9.9.3, 12.3
Nonconforming Work, Rejection and Correction of
2.3.1, 2.4.1, 3.5.1, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3,
9.10.4, 12.2.1
Notice
2.2.1, 2.3.1, 2.4.1, 3.2.4, 3.3.1, 3.7.2, 3.12.9, 5.2.1,
9.7.1, 9.10, 10.2.2, 11.3.1, 11.4.6, 12.2.2.1, 13.3,
13.5.1, 13.5.2, 14.1, 14.2, 15.2.8, 15.4.1
Notice, Written
2.3.1, 2.4.1, 3.3.1, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 9.7.1,
9.10, 10.2.2, 10.3, 11.1.3, 11.3.6, 12.2.2.1, 13.3, 14,
15.2.8, 15.4.1
Notice of Claims
3.7.4, 4.5, 10.2.8, 15.1.2, 15.4
Notice of Testing and Inspections
13.5.1, 13.5.2
Observations, Contractor’s
3.2, 3.7.4
Occupancy
2.2.2, 9.6.6, 9.8, 11.3.1.5
Orders, Written
1.1.1, 2.3, 3.9.2, 7, 8.2.2, 11.3.9, 12.1, 12.2.2.1,
13.5.2, 14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Information and Services Required of the
2.1.2, 2.2, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2,
9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.3, 13.5.1,
13.5.2, 14.1.1.4, 14.1.4, 15.1.3
Owner’s Authority
1.5, 2.1.1, 2.3.1, 2.4.1, 3.4.2, 3.8.1, 3.12.10, 3.14.2,
4.1.2, 4.1.3, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3.1,
7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.1, 9.3.2, 9.5.1, 9.6.4,
9.9.1, 9.10.2, 10.3.2, 11.1.3, 11.3.3, 11.3.10, 12.2.2,
12.3.1, 13.2.2, 14.3, 14.4, 15.2.7
Owner’s Financial Capability
2.2.1, 13.2.2, 14.1.1.4
Owner’s Liability Insurance
11.2
Owner’s Loss of Use Insurance
11.3.3
Owner’s Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2
Owner’s Right to Carry Out the Work
2.4, 14.2.2
Owner’s Right to Clean Up
6.3
Owner’s Right to Perform Construction and to
Award Separate Contracts
6.1
Owner’s Right to Stop the Work
2.3
Owner’s Right to Suspend the Work
14.3
Owner’s Right to Terminate the Contract
14.3
Ownership and Use of Drawings, Specifications
and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, 1.5, 2.2.5, 3.2.2, 3.3.4, 3.17.1,
4.2.12, 5.3.1
Partial Occupancy or Use
9.6.6, 9.9, 11.3.1.5
Patching, Cutting and
3.14, 6.2.5
Patents
3.17
Payment, Applications for
4.2.5, 7.3.7, 9.2.1, 9.3, 9.4, 9.5, 9.6.3, 9.7.1, 9.8.5,
9.10.1, 14.2.3, 14.2.4, 14.4.3
Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, 9.4, 9.5, 9.6.6, 9.7.1, 9.10.1,
9.10.3, 13.7, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, 9.7, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.4.1, 11.4.5,
12.3.1, 13.7, 14.2.4, 14.3
Payment Bond, Performance Bond and
7.3.7.4, 9.6.7, 9.10.3, 11.4.9, 11.4
Payments, Progress
9.3, 9.6, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3
PAYMENTS AND COMPLETION
9
Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 11.4.8,
14.2.1.2
PCB
10.3.1
Performance Bond and Payment Bond
7.3.7.4, 9.6.7, 9.10.3, 11.4.9, 11.4
Permits, Fees, Notices and Compliance with Laws
2.2.2, 3.7, 3.13, 7.3.7.4, 10.2.2
Transmission of Data in Digital Form

1.6
UNCOVERING AND CORRECTION OF WORK

12
Uncovering of Work

12.1
Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3
Unit Prices
7.3.3.2, 7.3.4
Use of Documents
1.1.1, 1.5, 2.2.5, 3.12.6, 5.3
Use of Site
3.13, 6.1.1, 6.2.1
Values, Schedule of
9.2, 9.3.1
Waiver of Claims by the Architect
13.4.2
Waiver of Claims by the Contractor
9.10.5, 11.4.7, 13.4.2, 15.1.6
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 11.4.3, 11.4.5, 11.4.7, 12.2.2.1, 13.4.2, 14.2.4, 15.1.6
Waiver of Consequential Damages
14.2.4, 15.1.6
Waiver of Liens
9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, 11.4.5, 11.3.7
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.4, 12.2.2, 13.7.1
Weather Delays
15.1.5.2
Work, Definition of
1.1.3
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.4.1, 13.2, 13.4.2, 15.4.4.2
Written Interpretations
4.2.11, 4.2.12
Written Notice
2.3, 2.4, 3.3.1, 3.9, 3.12.9, 3.12.10, 5.2.1, 8.2.2, 9.7, 9.10, 10.2, 10.3, 11.1.3, 11.4.6, 12.2.2, 12.2.4, 13.3, 14, 15.1.4
Written Orders
1.1.1, 2.3, 3.9, 7, 8.2.2, 11.4.9, 12.1, 12.2, 13.5.2, 14.3.1, 15.1.2

TIME
8
Time, Delays and Extensions of
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4.1, 8.3, 9.5.1, 9.7.1, 10.3.2, 10.4.1, 14.3.2, 6.1.5, 15.2.5

Time Limits
2.1.2, 2.2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 4.4, 4.5, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 11.4.1.5, 11.4.6, 11.4.10, 12.2, 13.5, 13.7, 14, 15.1.2, 15.4

Time Limits on Claims
3.7.4, 10.2.8, 13.7, 15.1.2

Title to Work
9.3.2, 9.3.3
ARTICLE 1  GENERAL PROVISIONS
§ 1.1 BASIC DEFINITIONS
§ 1.1.1 THE CONTRACT DOCUMENTS
The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor’s bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT
The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. Except as provided in section 3.18, nothing contained in the Contract Documents shall be construed to create a contractual relationship (1) between the Contractor and the Architect or the Architect’s consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect’s consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect’s duties.

§ 1.1.3 THE WORK
The term “Work” means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor’s obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT
The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS
The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS
The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE
Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect’s consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER
The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.1.9 NUMBER AND GENDER
The pronouns "they," "them," and "their" are used with a singular antecedent that is indefinite or that does not specific gender, in lieu of the masculine singular and feminine singular pronouns "he," "she," "him," "her," "his," and "her," and accordingly "they," "them," and "their" may be singular or plural depending on their antecedents and the context.
§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. All Work mentioned or indicated in the Contract Documents shall be performed by the Contractor as part of this Contract unless it is specifically indicated in the Contract Documents that such Work is to be done by others.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 In the event of conflicts or discrepancies among the Contract Documents, the documents shall be interpreted on the basis of the follow priorities: First, Modifications or Change Orders to the Contract Documents, those of later date having precedence over those of earlier date; Second, the Agreement between Owner and Contractor; Third, these General Conditions as modified; Fourth, Addenda to Specifications and Drawings, with later date having greater priority; Fifth, Specifications and Drawings.

Larger scale drawings shall take precedence over smaller scale drawings. Should Drawings or the Specifications disagree in themselves or with each other, the Contractor shall provide the better quality or greater quality of the Work unless otherwise directed by written addendum to the Contract.

§ 1.2.5 All indications or notations which apply to one of the number of similar situations, material or processes shall be deemed to apply to all such situations, materials or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the Contract Documents.

§ 1.2.6 Where codes, standards, requirements and publications of public and private parties are referred to in the Contract Documents, references shall be understood to be to the latest revision prior to the date bids are received or negotiations are concluded, except otherwise indicated.

§ 1.2.7 All manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the manufacturer’s written or printed directions and instructions unless otherwise indicated.

§ 1.2.8 Where the Work is to fit with existing conditions or Work to be performed by others, the Contractor shall fully and completely join the Work with such conditions or Work, unless otherwise specified.

§ 1.2.9 Exact locations of fixtures and outlets shall be obtained from the Architect before the Work is roughed in. Work installed without such information from the Architect shall be relocated at the Contractor’s expense.

§ 1.2.10 Existing condition plans and information included with the Contract Documents or otherwise made available to the Contractor were obtained by the Owner for use by the Architect in the design of the Project. The Owner does not hold out such information to the Contractor as an accurate or approximate indication of subsurface conditions, and no claim for extra cost or extension of time resulting from a reliance by the Contractor on such information shall be except allowed as provided in Section 3.7.4.

§ 1.2.11 Where no explicit quality or standards for materials or workmanship are established for Work, such Work is to be consistent with the quality of the surrounding Work and of the construction of the Project generally.

§ 1.2.12 Certain drawings (including mechanical, electrical and fire protection drawings) are diagrammatic only, and are not intended to show the alignment, physical locations or configurations of such Work. Such Work shall be
installed without additional cost to the Owner to clear all obstructions, permit proper clearances for the Work of other trades, and present an orderly appearance where exposed. Prior to beginning such Work, the Contractor shall prepare coordination drawings showing the exact alignment, physical location and configuration of the components of the mechanical, electrical, and fire protection and other allied systems and demonstrating to the Architect’s satisfaction that the installation of such systems will comply with the preceding sentence. The Contractor shall be solely liable and responsible for any such costs and/or delays resulting from the Contractor’s failure to coordinate such installations.

§ 1.3 CAPITALIZATION
Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, (3) the titles of other documents published by the American Institute of Architects, or (4) defined elsewhere in the Contract Documents.

§ 1.4 INTERPRETATION
In the interest of brevity the Contract Documents frequently omit modifying words such as “all” and “any” and articles such as “the” and “an,” but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE
§ 1.5.1 The Architect and the Architect’s consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect’s or Architect’s consultants’ reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects of for additions to this Project without the specific written consent of the Owner, Architect and the Architect’s consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM
If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER
§ 2.1 GENERAL
§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner’s approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term “Owner” means the Owner or the Owner’s authorized representative.

§ 2.1.2 Intentionally omitted.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER
§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner’s obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner’s ability to make payment when due.
§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall, with the Contractor’s cooperation when requested, secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall endeavor to furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work. The Owner does not hold out such information to the Contractor as accurate, and no claim for extra cost or extension of time resulting from a reliance by the Contractor on such information shall be allowed except as provided in section 3.7.4.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness after receipt from the Contractor of a written request for such information or services. The Owner shall also furnish any other information or services under the Owner’s control and relevant to the Contractor’s performance of the Work with reasonable promptness after receiving the Contractor’s written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2. The Contractor shall arrange for the reproduction of the additional Contract Documents as necessary, and the cost of such reproduction shall be included within the Contract Sum. The Owner shall cause the Architect to deliver electronic files with the Drawings to the Contractor which can be used by the Contractor to print additional sets (subject to any reasonable conditions imposed by the Architect).

§ 2.3 OWNER’S RIGHT TO STOP THE WORK
If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER’S RIGHT TO CARRY OUT THE WORK
If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner’s expenses and compensation for the Architect’s additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

§ 2.5 Extent of Owner Approval or Consent
Owner is relying on the Architect to exercise the appropriate standard of care in connection with the design of the Work and the Contractor for execution of the Work, including all construction means, methods and techniques. Notwithstanding anything else set forth in the Contract Documents, any “approval” or “consent” by Owner in the context of the design of the Work means only approval of programmatic and/or aesthetic design intent. In the context of execution of the Work, “approval” by Owner of schedules and/or work plans means that the Owner acknowledges such activities or events for purposes of timing or coordination only.

§ 2.6 Owner-Furnished Materials, Equipment or Fixtures
If the Contract Documents require that, as part of the Work, that Contractor shall install or incorporate into the completed construction materials, equipment or fixtures furnished by Owner, Contractor’s obligations under this agreement extend to such materials, equipment and fixtures on the same basis as the rest of the Work. Contractor’s
obligations to correct defective or non-conforming Work extends to and includes any and all materials, equipment, and fixtures furnished by Owner and to the installation thereof by the Contractor and the Subcontractors as fully as if such products had been purchased directly by Contractor or a Subcontractor for incorporation into the Work. The Contractor acknowledges that it has received and approved all information and specifications for any such Owner-furnished products sufficient so as to permit the Contractor to make this agreement. Such specifications for Owner-furnished materials, equipment or fixtures shall be considered a part of the Contract Documents and such items, upon delivery to, and acceptance by, Contractor, shall become a part of the Work.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term “Contractor” means the Contractor or the Contractor’s authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect’s administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. Before starting the Work, and at frequent intervals during the progress thereof, the Contractor shall carefully study and compare the Contract Documents with each other and with the information furnished by the Owner pursuant to section 2.2 and shall at once report to the Architect any error, inconsistency or omission the Contractor may discover. Any necessary change shall be ordered as provided in Article 7, subject to the requirements of section 1.2 and other provisions of the Contract Documents. If the Contractor proceeds with the Work without such notice to the Architect, having discovered such errors, inconsistencies or omissions, or if by reasonable study of the Contract Documents the Contractor should have discovered such, the Contractor shall bear all costs arising therefrom.

§ 3.2.1.1 The Drawings are generally drawn to scale; however, the figured dimensions or notes thereon shall govern. Before ordering any materials or doing any Work, the Contractor and each Subcontractor shall verify all measurements at the building site, and shall be responsible for the correctness of same. No extra charge or compensation will be allowed on account of differences between the actual measurements and the dimensions indicated on the Drawings, except to the extent such differences are attributable to errors and omissions in the Contract Documents prepared by the Architect of which the Contractor is not aware (unless the Contractor should have been aware of such errors and omissions in connection with its exercise of the standard of care exercised by a reasonable contractor experienced in the type of work required) and for which correction would constitute a material change in the Work per the process set forth in Section 7.1.4 below. All differences which may be found shall be reported in writing to the Architect for consideration before proceeding with the Work. The Contractor shall give the Architect timely notice of any additional Drawings, Specifications, or instructions required to define the Work in greater detail, or to permit the proper progress of the Work.

§ 3.2.1.2 The Contractor shall not proceed with any Work not clearly and consistently defined in detail in the Contract Documents, but shall request additional Drawings or instructions from the Architect. If the Contractor proceeds with such Work without obtaining further Drawings, Specifications, or instructions, the Contractor shall correct Work performed incorrectly at the Contractor’s own cost and expense.
§ 3.2.3 Intentionally omitted.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor’s notices or requests for information pursuant to Section 3.2.2, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Section 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor’s best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures (including all safety precautions and programs) and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the site safety thereof and, except as stated below, shall be fully and solely responsible for the site safety of such means, methods, techniques, sequences or procedures. If the Contractor believes that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall (a) give timely written notice to the Owner and Architect of the specific means, methods, techniques or procedures referred to in the Contract Documents that the Contractor believes are not safe or suitable; (b) participate in discussions with the Owner and the Architect regarding the specific means, methods, techniques or procedures referred to in the Contract Documents that the Contractor believes are not safe or suitable and (c) shall not proceed with that portion of the Work until the Owner, the Architect and the Contractor have agreed upon specific means, methods, techniques or procedures that the Contractor agrees are safe and suitable for the Work. The Contractor shall remain solely responsible for and have control over the means, methods, techniques or procedures that are employed by the Contractor for the Work, notwithstanding that such construction means, methods, techniques, sequences or procedures are (i) referred to, indicated or implied by the Contract Documents or (ii) agreed to by the Architect or Owner. In no event shall the Contractor employ construction means, methods, procedures and techniques that violate (x) requirements of any warranties applicable to the Work or (y) laws, ordinances, regulations, rules and orders which bear upon the Contractor’s performance of the Work.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor’s employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors. Nothing contained in this section shall alter the relationship between the Contractor and each Subcontractor under the applicable subcontract with respect to each such Subcontractor’s obligation for safety for persons or property.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 The Contractor shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that no trade, as a result of improper coordination or supervision, causes delay to the general progress of the Work. The Contractor and all Subcontractors shall at all times afford each trade, any separate contractor, or the Owner, every reasonable opportunity for the installation of Work and the storage of materials.

§ 3.3.5 The Contractor shall arrange for and attend job meetings with the Owner and the Architect and such other persons as the Architect or Owner may from time to time wish to have present. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized main office representative, as well as by the Contractor’s own superintendent. An authorized representative of any Subcontractor or lower tier subcontractor shall attend such meetings if the representative’s presence is required by the Owner or the Architect. Such representatives of the Contractor and the Subcontractors shall be empowered to making binding commitments on all
matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be served on such representatives.

§ 3.4 LABOR AND MATERIALS
§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. The word "provide" shall mean furnish and install complete, including connections, unless otherwise specified.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner. After evaluation by the Architect and in accordance with a Change Order or Construction Change Directive. If the Contractor desires to substitute a product or method in lieu of what has been specified or shown in the Contract Documents, the Contractor may propose to do so in a written request to the Architect setting forth the following: (1) full explanation of the proposed substitution and submittal of all supporting data including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, and other like information for the original specified item and the proposed substitution as necessary for a complete evaluation of the substitution; (2) reasons why the substitution is advantageous or necessary, including the benefits to the Owner and the Work in the event the substitution is acceptable; (3) the adjustment, if any, in the Contract Sum in the event that substitution is acceptable; and (4) the adjustment, if any, in the Contract Time in the event that substitution is acceptable. Proposals for substitutions shall be submitted to the Architect, with a copy to the Owner, not later than 30 days prior to the time of such substitute product or method would be incorporated in the Work or, if to be used or incorporated within 30 days of the commencement of the Work, immediately upon execution of the Agreement. No substitutions will be considered or allowed without the Contractor’s submittal of complete substantiating data and information as stated herein. Approval of a proposed substitution shall be at the sole discretion of the Owner (after consulting with the Architect).

§ 3.4.2.1 By making a request for substitution, the Contractor: (1) represents that the Contractor has investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified; (2) represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified; (3) certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect’s redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and (4) will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

§ 3.4.2.2 The Contract Documents are intended to produce a build-out of consistent character and quality of design. All components of the building, including visible items of mechanical and electrical equipment, have been selected to have a coordinated design in relation to the overall appearance of the building. The Architect shall judge the design and appearance of proposed substitutes on the basis of their suitability in relation to the overall design of the Project, as well as for their intrinsic merits. The Architect will not approve as equal to materials specified proposed substitutes which, in the Architect’s opinion, would be out of character, obtrusive, or otherwise inconsistent with the character and quality of design of the Project. In order to permit coordinated design of color and finishes, the Contractor shall, if required by the Architect, furnish the substituted material in any color, finish, texture, or pattern which would have been available from the manufacturer originally specified, at no additional cost to the Owner.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor’s employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them. The Owner may require removal of any workers from the Project that it deems unfit or not beneficial to the Project. The Owner reserves the right to require the Contractor to perform a background check of any worker employed by the Contractor or any of its subcontractors. If so request, the Contractor shall perform the background check to the Owner’s satisfaction and shall provide the results to the Owner within a reasonable time period established by the Owner.
§ 3.4.4 All manufactured materials shall be ordered to be delivered in the manufacturer’s original, unbroken packages, containers or bundles, bearing the name of the manufacturer and brand name of other designation, and all materials shall be handled, stored, installed, cleaned and protected in accordance with the manufacturer’s directions, unless otherwise indicated in the Contract Documents.

§ 3.4.5 Any product, material or equipment specified in the Contract Documents by reference to the number, symbol or title of a specified standard, such as a commercial standard, federal specification, trade association standard, or other similar or related construction industry standard, shall comply with requirements in the latest revision thereof as of the date the Owner and the Contractor execute the Agreement.

§ 3.4.6 In all cases in which a manufacturer’s name, trade name or other property designation is used in the Contract Documents in connection with a material, equipment or product to be furnished thereunder, the Contractor shall furnish the material, equipment or product of the named manufacturer(s) unless a written request for substitution is made in accordance with section 3.4.2 and the substitution is approved in writing by the Owner.

§ 3.4.7 The Contractor and all Subcontractors shall make all provisions necessary to avoid any disputes with labor unions and shall be responsible for any delays, damages or extra costs incurred as a result of such disputes. The Contractor shall be responsible for the maintenance of harmonious labor relations among its employees and the employees of its Subcontractors in such manner as will provide for harmony as far as practical among workers at the Project site. Prior to contracting with any Subcontractor, the Contractor will require such Subcontractor to certify its willingness to cooperate with not only the other Subcontractors hired by the Contractor, but also with the Owner, Architect, any other contractors hired by the Owner, and their subcontractors. Any Subcontractor not cooperating shall, at the Owner’s reasonable discretion, be dismissed by the Contractor and a qualified replacement subcontractor shall be hired at the Contractor’s expense.

§ 3.5 WARRANTY
The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor’s warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 The Contractor shall be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. The Architect may require the Contractor to produce reasonable evidence that materials used meet such requirements, such as certified reports or past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the Architect, would lead to a reasonable certainty that any material used, or proposed to be used, in the Work meets the requirements of the Contract Documents. All such data shall be furnished at the Contractor’s expense.

§ 3.5.3 The warranty provided in this section 3.5 shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise provided by law.

§ 3.5.4 The Contractor hereby assigns to the Owner, effective at the time of Substantial Completion of the Work, any and all manufacturer’s warranties required by the Contract Documents relating to materials and labor used in the Work and further agrees to perform the Work in such manner so as to preserve all such manufacturer’s warranties.

§ 3.5.5 The Contractor shall procure and deliver to the Architect, prior to final payment, all special warranties required by the Contract Documents. Delivery by the Contractor shall constitute the Contractor’s guarantee to the Owner that the warranty will be performed in accordance with its terms and conditions.
§ 3.6 TAXES
The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are
legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled
to go into effect.

§ 3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS
§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building
permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper
execution and completion of the Work that are customarily secured after execution of the Contract and legally
required at the time bids are received or negotiations concluded. The Contractor shall apply for required licenses,
permits, inspections and/or approvals sufficiently in advance of the time required to allow the Contractor and/or the
Architect to respond to any municipal comments, conditions or requests (including, without limitation, changes to
the Work) without delaying the progress of the Work.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes,
rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes,
rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility
for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1)
subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract
Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily
found to exist and generally recognized as inherent in construction activities of the character provided for in the
Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions
are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly
investigate such conditions and, if the Architect determines that they differ materially and cause an increase or
decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an
equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions
at the site are not materially different from those indicated in the Contract Documents and that no change in the
terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the
reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as
provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial
markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately
suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such
notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume
the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but
shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the
Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in
Article 15.

§ 3.7.6 The Contractor shall be responsible for familiarizing itself with the regulatory requirements governing the
disposal of material, including material containing pollutants, from the site. The Owner will not recognize claims for
additional disposal costs that could reasonably have been anticipated at the time of bidding.

§ 3.8 ALLOWANCES
§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items
covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct,
but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable
objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,
. allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
.2 Contractor’s costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor’s costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT
§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection. The Owner may require the Contractor to provide additional supervision to assist the superintendent when Owner determines the workload requires it.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made unreasonable and timely objection. The Contractor shall not change the superintendent without the Owner’s consent, which shall not unreasonably be withheld or delayed. The Contractor shall remove the superintendent if requested to do so by writing by the Owner, and shall promptly replace him with a competent person reasonably acceptable to the Owner.

§ 3.9.4 The superintendent shall keep a daily log of the progress of the Work and make it available to the Owner at all times. A copy of the log shall be submitted to the Owner upon completion of the Project. Additionally, daily field reports recording work activities, labor force and other information as required by the Owner shall be prepared daily by the Contractor and each subcontractor and submitted to the Owner.

§ 3.9.5 The Contractor shall furnish to both the Owner and the Architect the names, addresses and telephone numbers of the project manager, the superintendent, the superintendent’s immediate supervisor, the superintendents of all subcontractors, and at least two other of their and their subcontractor’s authorized representatives, indicating where they can be contacted at times other than normal working hours in case of emergency.

§ 3.9.6 The Contractor’s superintendent shall not be assigned to or become involved in any project other than that of this Contract. He/she shall remain in attendance at the site and, except for illness or other reason excusable to the Owner, shall be present at all times when Work of any kind is being done, including Work done during overtime. If absent for illness or other reason excusable to the Owner, a replacement having full authority and responsibility of the full-time superintendent shall be provided.

§ 3.9.7 The Contractor shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that no trade, at any time, causes delay to the general progress of the Work. The Contractor and all Subcontractors shall at all times afford each trade, any separate contractor, or the Owner, every reasonable opportunity for the installation of Work and the storage of materials.

§ 3.10 CONTRACTOR’S CONSTRUCTION SCHEDULES
§ 3.10.1 The Contractor, promptly after being awarded the Contract, or in the case of a GMP as part of the GMP Proposal, shall prepare and submit for the Owner’s and Architect’s information a Contractor’s construction schedule for the Work (the “Schedule”). The Schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the
entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.1.1 The Schedule shall utilize the Critical Path Method of scheduling within a format acceptable to the Owner and shall be submitted in digital and hardcopy (paper or vellum) formats. The Schedule shall be developed with and shall be subject to approval by the Owner and shall: (i) comply with and include any the Milestone Dates required by the Contract Documents, including but not limited to Substantial Completion and Final Completion for each phase of Work, along with any other Milestone Dates as required by the Owner; (ii) show the Contractor's overall approach to the planning, scheduling and execution of the Work, including schedule activities for all Work components ("Activities"), Notice to Proceed, procurement of permits, shop drawing submittals, review and approval, anticipated design submittals, material and equipment procurement and delivery, third party interfaces (e.g., utility work), and closeout and commissioning; (iii) include only Activities with durations equal to or less than ten (10) calendar days; (iv) include logic relationships between Activities reflecting the Contractor's as-planned sequencing of Work; and (v) identify any planned overtime.

§ 3.10.1.2 The Contractor shall monitor the progress of the Work for conformation with the requirements of the Schedule and shall promptly advise the Owner of any actual delays or potential delays. The Contractor shall deliver a written report to the Owner each month (or more frequently if requested by the Owner or the Architect) setting forth the actual progress of the Work and highlighting discrepancies between the actual progress of the Work and the Schedule (such updates are sometimes referred to in these General Conditions as "Progress Reports"). In the event any progress report indicates delays in achievements of any Milestone Date, the Contractor shall propose in written form an affirmative plan (the "Corrective Plan") to correct the delay, including overtime, re-sequencing of Work and/or additional labor, if necessary, which Corrective Plan shall indicate the date by which the progress of the work will comply with the Schedule, and shall be subject to the approval of the Owner. In no event shall any progress report or Corrective Plan constitute an adjustment in the Schedule, Contract Time or any Milestone Date unless any such adjustment is agreed to by the Owner and authorized pursuant to a Change Order.

§ 3.10.1.3 In the event (i) that the performance of the Work as of a Milestone Date has not progressed or reached the level of completion required by the Schedule, and (ii) the Contractor fails to submit a Corrective Plan that is approved by the Owner or the progress of the Work is not brought back into compliance with the Schedule on the date proposed by an approved Corrective Plan, the Owner shall have the right to order the Contractor to take corrective measures to expedite the progress of the work, including, without limitation, (1) supplying additional shifts or overtime, (2) supplying the additional manpower, equipment, and facilities, (3) re-sequencing of Work, and (4) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the Schedule. The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner under or pursuant to this Section 3.10.1. The Owner may exercise the rights furnished the Owner under or pursuant to this Section 3.10.1 as frequently as reasonably necessary to ensure that the Contractor's performance of the work complies with the Schedule.

§ 3.10.1.4 In conjunction with the monthly Schedule submission, the Contractor shall draft and submit to the Owner a narrative explaining in detail all changes to the previous Schedule, lack of progress, delays, slippage or accelerations. The Owner at any time may require the Contractor to develop and submit an additional written mitigation plan based on feasible field actions that shall address and correct such delays, progress impediments, schedule slippage or missed Milestone Dates.

§ 3.10.1.5 Float or slack time associated with any one chain of activities is defined as the amount of time between the earliest start date and the latest start date or between the earliest finish date and the latest finish date for such activities, as set forth in the Schedule required under this Agreement, including any revisions or updates thereto. The Owner shall retain all beneficial rights to all schedule float including that resulting from any scheduled or actual completion in less than the Contract Time. The Contractor shall in no way be entitled to any compensation for any delays for interference with or denial of any "early finish" or "early completion" of the Work. Extensions of time for performance will be granted only to the extent that the equitable time adjustments for the activity or activities affected exceed the total float along the activity chain involved at the time the change was ordered or the delay...
occurred. Notwithstanding the above, the Contractor shall only be entitled to an extension of time for an excusable delay to the critical path of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect’s approval. The Architect’s approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor’s construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE
The Contractor shall maintain at the site one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record field changes and selections made during construction (the “As-built Documents”), and one record copy of approved Shop Drawings, Product Data, Samples and similar required submittals. The markups to the As-Built Documents shall consist of record information including: (i) deviations from the Drawings made during construction; (ii) details in the Work not previously shown; (iii) changes to existing conditions or existing conditions found to differ from those shown on the Drawings; (iv) the actual installation of equipment, piping conduits, light switches, electric fixtures, circuiting, ducts, dampers, access panels, control values, drains, openings, and sub-outs; and (v) such other information as the Owner may reasonably request. The Architect and/or the Owner’s Representative (a) make routine edits and updates to the Drawings prepared by or on behalf of the Architect that are normal in the course of construction administration at mutually acceptable times during construction of the Project and (b) deliver such updated Drawings to the Contractor (in printed and electronic form) for use by the Contractor in preparing the Record Documents (subject to any reasonable conditions imposed by the Architect or Owner’s Representative). Upon completion of the Work, the Contractor shall deliver to the Architect the marked As-Built Documents and reproducible transparencies thereof. Approval by the Architect, Owner’s Representative, and the Owner of As-Built Documents prepared by the Contractor and its Subcontractors and suppliers shall be a condition precedent to the Owner’s obligation to make final payment to the Contractor. The Contractor shall also deliver to the Architect all operations manuals for equipment as a condition precedent to final payment by Owner.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.
§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. The accuracy of all such information is the responsibility of the Contractor. In reviewing Shop Drawings, Product Data, Samples, and similar submittals, the Architect shall be entitled to rely upon the Contractor’s presentation that such information is correct and accurate.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect. The portions of the Work that are the subject of the approved submittal shall be completed in accordance with such approved submittal.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect’s approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect’s approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. Unless such written notice has been given, the Architect’s approval of resubmitted Shop Drawing, Product Data, Sample, or similar submittal shall not constitute approval of any changes not requested on the prior submittal.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor’s responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required by the Contractor by the Contract Documents, the Owner and the Contractor will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional’s written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The right of possession of the premises and the improvements made thereon by the Contractor shall remain at all times in the Owner. The Contractor’s right to entry and use thereof arises solely from the permission granted by the Owner under the Contract Documents. The Contractor shall confine the Contractor’s apparatus, the storage of materials, and the operations of the Contractor’s workers to limits indicated by law, ordinances, the Contract Documents and permits and/or directions of the Architect and/or the Owner and shall not unreasonably encumber the premises with the Contractor’s materials. The Owner shall not be liable to the Contractor, Subcontractors, their employees or anyone else with respect to the condition of the premises. The Owner shall have the right to refuse admittance to the site to any agent or employee of the Contractor or Subcontractors whose presence the Owner deems hostile to the Owner’s interest.
§ 3.14 CUTTING AND PATCHING
§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor’s consent to cutting or otherwise altering the Work. Existing work that is cut, damaged, disturbed or otherwise interfered with by the Contractor, a Subcontractor, or anyone for whom they are responsible shall be fully, properly and carefully repaired by the responsible Contractor or Subcontractor. All such repairs shall be completed in a first-class manner to the satisfaction of the Architect, and shall match similar existing adjoining work.

§ 3.15 CLEANING UP
§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor’s tools, construction equipment, machinery and surplus materials from and about the Project. Immediately prior to the Architect’s inspection for Substantial Completion, the Contractor shall completely clean the premises. Concrete and ceramic surfaces shall be cleaned and washed. Resilient coverings shall be cleaned, waxed and buffed. Woodwork shall be dusted and cleaned. Sash, fixtures and equipment shall be thoroughly cleaned. Stains, spots, dust, marks and smears shall be removed from all surfaces. Hardware and all metal surfaces shall be cleaned and polished. Glass and plastic surfaces shall be thoroughly cleaned by professional window cleaners. All damaged, broken or scratched glass or plastic shall be replaced by the Contractor at the Contractor’s expense.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK
The Contractor shall provide the Owner and Architect safe access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS
The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION
§ 3.18.1 To the fullest extent permitted by law the Contractor shall defend (with counsel reasonably satisfactory to Owner), indemnify and hold harmless the Owner, Architect, Architect’s consultants, its lenders and affiliates, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys’ fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), caused in whole or in part by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.
§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers’ compensation acts, disability benefit acts or other employee benefit acts.

§ 3.19 LIENS
§ 3.19.1 In the event that any Subcontractor, supplier or any other party for whom the Contractor is responsible establishes a lien against the Work and/or the Project site, the Contractor shall, within five days of receipt of notice from the Owner regarding such lien, cause the lien to be discharged (either by obtaining and recording a lien discharge bond from a surety and in a form acceptable to the Owner or otherwise) at no cost to the Owner, except to the extent that the lien is directly and solely attributable to a failure by the Owner to pay undisputed amounts to the Contractor as and when due under the Contract Documents. If the Contractor fails to cause the lien to be discharged within such five day period, the Owner shall have the right to withhold all further payments to the Contractor until the lien is discharged. The Owner may either (a) apply amount so withheld to discharging such lien or (b) retain such amounts until such lien is discharged or released by the Contractor or the lienor, and shall thereafter credit to the Contractor any amounts remaining after payment of the fees and expenses the Owner incurs in connection with such lien. The Contractor agrees to indemnify and hold harmless the Owner from all costs and expenses incurred by the Owner in connection with such liens. For purposes of this Section 3.19.1, the term "lien" shall mean any instrument filed with the applicable land title records which creates or perfects a lien under any lien law.

§ 3.20 PROTECTION FROM WATER DAMAGE
§ 3.20.1 In performing the Work, the Contractor shall exercise diligent efforts to protect the building and to cause all materials, supplies, systems and equipment which are delivered to the Project site from exposure to, and damage from, water. Without limiting the generality of the foregoing, the Contractor shall (a) install temporary barriers adequate to prevent water entry to the building from openings in the roof, exterior walls or other applicable building elements to the extent related to the Work, (b) cause all materials, supplies, systems and equipment which are delivered to the Project site to be stored in a safe and secure location, packaged in a watertight manner where possible, and stored in a manner which protects such items from inclement weather, the elements (including, without limitation, rain, snow and water damage) and other damage until such items are incorporated into the work, and (c) ensure that all plumbing components and exterior elements included within the Work are constructed and installed in accordance with the Contract Documents so as not to allow water leaks or penetration.

§ 3.20.2 In addition to (and not in limitation of) the indemnification obligations of Contractor set forth in Section 3.18 above, Contractor shall defend, indemnify and hold harmless the parties indemnified under Section 3.18 above to the fullest extent permitted by law from all claims arising out of or resulting from the failure of Contractor (or any subcontractor of any tier) to comply with the provisions of this Section 3.20. The foregoing indemnification shall include, without limitation, any Claim attributable to (i) bodily injury, sickness, disease or death arising out of or relating to, and (ii) the costs of any abatement, clean-up, removal and disposal (to the satisfaction of Owner) of any mold, fungal growth, spores or the like which occurs at the Project site as a result of any failure by Contractor (or any subcontractor of any tier) to comply with the provisions of this Section 3.20.

ARTICLE 4 ARCHITECT
§ 4.1 GENERAL
§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.
§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents until the date the Architect issues the final Certificate For Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.
§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4 not involving an adjustment in the Contract Sum or an extension of the Contract Time. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner’s review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect’s responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect’s response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.12.1 The Architect may, as the Architect judges desirable, issue additional drawings or instructions indicating in greater detail the construction or design of the various parts of the Work; such drawings or instructions may be effected by field order or other notice to the Contractor, and provided such drawings or instructions are reasonably consistent with the previously existing Contract Documents, the Work shall be executed in accordance with such additional drawings or instructions without additional cost or extension of the Contract Time. If the Contractor claims additional cost or time on account of such additional drawings or instructions, the Contractor shall give the notice provided in Article 15.

§ 4.2.13 The Architect’s decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents and the agreement of the owner.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect’s response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5  SUBCONTRACTORS
§ 5.1 DEFINITIONS
§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term “Subcontractor” is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term “Subcontractor” does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term “Sub-subcontractor” is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK
§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design)
proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work and of complying with bonding, insurance and other applicable requirements under the Contract Documents, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor’s Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.2.5 The form and content of each subcontract shall be submitted to the Owner for its approval, which shall not be unreasonably withheld or delayed. Each subcontract shall expressly provide for the contingent assignment referred to in Section 5.4.1.

§ 5.3 SUBCONTRACTUAL RELATIONS
By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including without limitation the responsibility for safety of the Subcontractor’s Work and the obligations set forth in Section 3.18, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors. Each subcontract agreement shall state that (1) the Subcontractor agrees that the Contractor’s rights under the subcontract agreement may (a) be assigned to the Owner, subject to the conditions of Section 5.4.1 of these General Conditions, (b) include agreements to mediate consistent with those in the Contract Documents and (c) be terminated without penalty or premium if the Contractor’s services are terminated. By entering into a subcontract for any portion of the Work, a Subcontractor shall be deemed to have agreed to the terms of the preceding sentence as if such terms were included in its subcontract agreement, and (2) the Subcontractor shall be required to perform its Work in accordance with all applicable laws, statutes, ordinances, building codes, rules and regulations without any adjustment to the subcontract amount or time for performance.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS
§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor’s rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor’s compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor’s obligations under the subcontract.

§ 5.5 Contractor will require each Subcontractor to employ a competent superintendent or trade foreman who shall be in attendance at the Project site during the progress of Subcontractor’s Work.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER’S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner’s own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.1.1 Notwithstanding anything to the contrary, the Owner shall have the right to install fixed and loose furniture, furnishings, fixtures, data communications lines, equipment and other items during the Contractor’s performance of the Work or portion(s) thereof. The Owner and the Contractor shall cooperate in scheduling and coordinating any such activities by or on behalf of the Owner. Any such installation or activities by or on behalf of the Owner shall not be deemed as acceptance of any part of any Work not completed in accordance with the Contract Documents.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term “Contractor” in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner’s own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Intentionally omitted.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor’s construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor’s Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner’s or separate contractor’s completed or partially completed construction is fit and proper to receive the Contractor’s Work, except as to defects not then reasonably discoverable.
§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor’s delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor’s delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER’S RIGHT TO CLEAN UP
If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK
§ 7.1 GENERAL
§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.1.4 If, subsequent to execution of the Agreement, the Architect issues any proposal requests, supplemental instructions, sketches and other materials intended to further define, clarify or modify the Contract Documents (collectively, the “Supplemental Material”) Contractor shall, within ten (10) days of receiving any Supplemental Material, notify the Architect and Owner’s Representative in writing of any error, inconsistency or discrepancy that the Contractor discovers between the Supplemental Materials and the Contract Documents and indicate whether the Supplemental Material have any impact upon the Contract Sum and/or the Contract Time. Failure of the Contractor to provide such notice is hereby deemed to mean: (1) such Supplemental Materials are consistent with the Contract Documents; (2) do not require a change in the Contract Sum and/or Contract Time; and (3) Contractor is willing and able to perform all of the Work for the Contract Sum, and in accordance with all the requirements of the Contract Documents. If the Contractor notifies the Owner’s Representative and Architect that it believes the Supplemental Materials are either inconsistent with the Contract Documents and/or represent added Work or will delay performance in accordance with the Project schedule, the Owner’s Representative and Architect will review the Contractor’s response and provide the Owner with recommendations for approval or disapproval, and the Owner shall have one or more of the following options:

(a) The Owner may direct the Architect to modify that aspect of the Supplemental Materials to which the Contractor objects. The Contractor shall cooperate with the Owner, Owner’s Representative and the Architect during the modification effort and shall make recommendations appropriate to correct such portions of the Supplemental Materials. The Architect shall submit to the Contractor the revised Supplemental Materials as approved by the Owner. The Contractor shall promptly reexamine such revised Supplemental Materials as described in Section 7.1.4;

(b) If, upon review of the Contractor’s notice, the Owner (after consultation with the Architect and Owner’s Representative) believes that the portion of the Work described therein does not constitute a material change in the Work, or disagrees as to the impact claimed by the Contractor to the Contract Sum or Contract Time,
as applicable, the Owner may so advise the Contractor through the Owner’s Representative or Architect. If such disagreement is not promptly resolved, the Work subject to disagreement shall be identified in a schedule (the “Disputed Work Schedule”). Whenever possible, the Owner and the Contractor shall resolve items set forth in the Disputed Work Schedule confirming such resolution in Change Orders. Items in the Disputed Work Schedule that are not resolved by the Owner and the Contractor shall be subject to the dispute resolution procedures set forth in Article 15. During the pendency of such dispute resolution procedures, all items remaining in the Disputed Work Schedule shall be performed by the Contractor as required by the Contract Documents and a tentative adjustment shall be made to the Contract Sum to the extent of any undisputed aspect of the item. No adjustment shall be made to the Contract Sum for any disputed item or portion of an item. For each remaining item in the Disputed Work Schedule, the Contractor shall keep a specific, detailed accounting of the time and materials required to complete such item. Adjustments to the Schedule shall not be permitted on a tentative basis; or

   (c) If, upon review of such notice from Contractor, the Owner agrees that all or a portion of the Work therein entitles the Contractor to Change Order and the Owner elects not to direct the Architect to modify the Supplement Materials, the Owner and the Contractor shall enter into a written Change Order providing for such agreed changes to the Contract Sum and/or Contract Time, as applicable.

§ 7.1.5 Unless otherwise agreed to by the Owner, the aggregate limitation on the amount of profit and overhead that the Contractor, each Subcontractor and all lower lien subcontractors and suppliers can charge for Work performed pursuant to Change Orders and Construction Change Directives shall be as follows: (a) for the Contractor for Work performed by the Contractor’s own forces, _ten_ percent (10.%) of the cost of the Work; (b) for the Contractor for Work performed by Subcontractors, _five_ percent (5.%) of the cost of such Work; (c) for each Subcontractor for Work performed by such Subcontractor’s own forces, _ten_ percent (10.%) of the cost of such Work for overhead and for profit; and (d) for each Subcontractor for Work performed by lower tier subcontractors, _five_ percent (5.%) of the cost of such Work for overhead and for profit. This aggregate combined profit and overhead amount shall include all other markups and non-direct costs.

§ 7.2 CHANGE ORDERS
§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:
   .1 The change in the Work;
   .2 The amount of the adjustment, if any, in the Contract Sum; and
   .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Unless expressly reserved therein, an executed Change Order shall constitute a final settlement of all matters relating to the change in the Work which is subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change, any adjustments to the Contract Sum or GMP and any adjustments to the Schedule, Contract Time and/or Milestone Dates.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES
§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:
   .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
   .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 Failure of the Contractor to notify the Owner of any disagreement with any proposed adjustment to the Contract Sum or Contract Time, as applicable, or method for determining them set forth in a Construction Change Directive within ten days after the date of receipt by the Contractor of such Construction Change Directive shall be deemed to be an agreement by the Contractor to the proposed adjustment to the Contract Sum or Contract Time or method for determining them set forth in such Construction Change Directive. If the Contractor disagrees in writing on a timely basis with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit in accordance with Section 7.1.5 above. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. If the Owner and the Contractor fail to agree on the adjustment to the Contract Sum or Contract Time, as applicable, or method for determining them arising from any Construction Change Directive, (a) the adjustment to the Contract Sum shall be the net increase or decrease in the Cost of the Work attributable to the Construction Change Directive plus markup per Section 7.1.5 and (b) the adjustment to the Contract Time shall be equal to the net increase or decrease (if any) in the time required to perform the entire Work attributable to the Construction Change Directive. As used in this Section, the term "Cost of the Work" for Contractor shall mean the Cost of the Work as defined in the Agreement and for Subcontractors as defined in Section 7.6 below. Any disagreement as to the determination of such items that are not resolved by the Owner and the Contractor shall be subject to the dispute resolution procedures set forth in Article 15 of these General Conditions of the Contract.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.
§ 7.4 MINOR CHANGES IN THE WORK
The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

§ 7.5 BACK-UP FOR CHANGE ORDERS
§ 7.5.1 Lump Sum Proposal: The Contractor, Subcontractor or lower tier subcontractor’s proposal covering the extra Work or change will be itemized for the various components of Work and segregated by labor, material and equipment in a detailed format satisfactory to the Owner. Such format will include a material and labor quantity take-off and related pricing information and extensions (by drawing, if applicable). The Contractor will furnish his itemized lump sum proposal and the similarly detailed proposals of any Subcontractors, lower tier subcontractors or material suppliers.

§ 7.5.2 Time and Material: Should the Owner elect to have the extra Work or change performed on a time and material basis, and so notify the Contractor in writing, the Contractor, Subcontractor or lower tier subcontractor shall perform the Work in such manner. Records supporting the actual cost of the Work (as defined in the Section 7.6) performed must be kept and forwarded to the Owner’s representative. Such records include, but are not limited to, material tickets for all actual material used, daily time sheets itemizing workmen’s names and hours worked for all actual labor costs, and such other evidence as the Owner’s representative may reasonably request. Owner may require authentication of all time sheets and material tickets. If so requested, the failure to provide such authentication may constitute a waiver of any rights to payment of the Contractor, Subcontractor or any lower tier subcontractor for the extra Work or change performed.

§ 7.5.3 Unit Prices: The Contractor, Subcontractor or lower tier subcontractor’s proposal shall itemize the quantities of each item of Work for which there is an applicable unit price. The quantities must be itemized in relation to each specific Contract Drawing.

§ 7.6 ACTUAL COST OF THE WORK FOR SUBCONTRACTORS
§ 7.6.1 If performed on a time and material basis, the Actual Cost of the Work for a Subcontractor shall comprise the following elements:

§ 7.6.1.1 Direct Job Costs for Labor: The number of hours, hourly payroll cost, labor burden (as defined in 7.6.1.2) and extended totals for each item of Work to arrive at the cost for direct job site labor including working foremen. All other administration, clerical expense and supervision above the level of working foremen (such as general foremen, superintendent, project manager, etc.) shall be considered covered by the Subcontractor’s mark-up per Section 7.1.5.

§ 7.6.1.2 Labor Burden: The employer’s net actual cost of payroll taxes (FICA, SUTA, FUTA), net actual cost of union benefits, and net actual cost for workers’ compensation insurance, taking into consideration adjustments for experience modifiers, premium discounts, dividends, rebates, etc. Labor burden shall not be considered to include costs of Commercial General Liability Insurance, auto insurance or umbrella insurance which shall be considered covered by the Subcontractor’s mark-up per Section 7.1.5.

§ 7.6.1.3 Direct Job Costs for Materials & Equipment: The quantity, price and extended totals for each item of Work to arrive at the costs of direct material and equipment. Appropriate amounts may be included for the rental of major equipment (defined as tools and equipment with individual purchase costs of more than $1,000) specifically needed to perform the extra Work or change. Use of small tools (defined as tools and equipment with individual purchase costs of less than $1,000) is considered covered by the mark-up percentage to be added to the direct cost of the extra work or change. Cost, for construction equipment, shall be the lower of the total expected rental cost or ownership cost equivalent including transportation charges and all applicable taxes.

§ 7.6.2 If performed on a unit price basis, the Actual Cost of Work shall comprise the following elements:

§ 7.6.2.1 Unit prices are for Work complete, measured in place (i.e., actual quantity installed) and cover profit and all other costs and expenses of the Contractor, Subcontractor or lower tier subcontractor. Unit prices include, without limit, all conditions of the Contract and all general requirements such as layout, reproduction of Drawings.
and Specifications, testing and inspection, shop drawing and sample coordination, supervision (field and home office), small tools and expendable items, insurance, taxes, temporary facilities and services, including access and safety provisions, "as-built" drawings, and general and administrative overhead and profit.

§ 7.6.2.2 Unit Price Application: For unit price items, additions and deletions of like items shall be algebraically summed and then multiplied by the applicable unit prices.

§ 7.6.3 Any changes undertaken without the Architect’s or the Owner’s authorization will not be recognized as a basis for a Claim for extra cost at a later date. If the Contractor claims that any instructions or orders, whether oral, written, by drawings, or otherwise, involve extra cost or time, and such instructions or orders are not accompanied by a written acknowledgement by the Owner or the Architect that extra payment will be made or time extended, they shall promptly so notify the Architect in writing and should not proceed with the Work until they have received a further written order to proceed, except in cases of emergency affecting life or property. No claim for extra cost or time on account of such instructions shall be valid unless the Contractor has so notified the Architect, before proceeding, that they claim extra cost and time and has received the further written order from the Owner’s representative to proceed.

ARTICLE 8 TIME
§ 8.1 DEFINITIONS
§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term “day” as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION
§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME
§ 8.3.1 If the Contractor is delayed at any time in the progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by area-wide labor disputes not directed expressly at Contractor or any Subcontractor, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor’s control; or by delay authorized by the Owner; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Construction Change Directive for such reasonable time as the Architect may determine. The Contractor acknowledges and agrees that (a) no adjustments to the Contract Time shall be made unless the events described above shall have the effect of actually delaying completion of components of the Work on the critical path indicated in the Schedule and (b) adjustments to Milestone Dates and/or the Contract Time will be permitted in connection with any such delay only to the extent such delay (i) is not caused, or could not have been avoided, by the Contractor, (ii) could not be limited or avoided by the Contractor’s timely notice to the Owner of the delay, (iii) has an impact of at least one (1) day and (iv) has no concurrent or contributing cause for which the Contractor would not be entitled to an extension of the Contract Time. Notwithstanding anything to the contrary, the Contractor shall
not be entitled to any extension in the Contract Time for delays in receiving required licenses, permits, inspections or approvals unless the Owner is required to provide or obtain such licenses, permits, inspections or approvals.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15 and this section 8.3.2 through section 8.3.8 below. Contractor’s written Claim for extension of Contract Time shall be accompanied by detailed dates, correspondence, notices, and any other data which provides proof of the events which are the basis for the Claim, including a network analysis justifying the time extension. Said network analysis shall specifically detail the extension of the critical path of the Project caused by the events which underlie the time extension request.

§ 8.3.3 Should the Contractor be delayed in the performance of the Work, the Contractor shall (a) notify the Owner and the Architect in writing within three (3) days following the event or occurrence causing such delay and (b) notify the Owner and the Architect of the estimated extent of the delay and the cost, if any, which may be incurred as result of the delay within twenty-one (21) days following the event or occurrence causing such delay. If the Contractor fails to so notify the Owner and the Architect, the Contractor shall be barred from asserting any claim for compensation, expense or damages with respect to such delay.

§ 8.3.4 No claim for delay shall be allowed on account of failure of the Architect to furnish Drawings, Specifications or instructions, or to return Shop Drawings or Samples until a reasonable period of time (but in any event not less than fifteen days or such longer period as may be agreed to among the Architect, the Contractor and the Owner) after receipt by the Architect of written demand for such instructions, Drawings, or Samples, and not then unless the Contractor shows that the Architect’s delay has materially interfered with the progress of the Work.

§ 8.3.5 Notwithstanding anything to the contrary in any of the Contract Documents, the Contractor acknowledges and agrees that no extension of time shall be granted on account of weather conditions except as provided for in this Section 8.3.5. A Claim by the Contractor for an increase in the Contract Time on account of weather shall only be granted if all the following conditions are met: (1) the weather during any calendar month (or pro rata portions of partial months at the beginning and end of the Contract Time) is “abnormal,” as defined below; (2) the Contractor demonstrates that such abnormal weather had the effect of delaying completion of components of Work on the critical path indicated in the Construction Schedule; and (3) such Claim is made by written notice. “Abnormal weather” shall, for purposes of this Section, be limited to circumstances in which adverse weather conditions significantly exceed those which have historically been encountered, or may reasonably be expected to be encountered, at the Project site.

§ 8.3.6 If any of events described in this Section 8.3 of the General Conditions of the Contract entitle the Contractor to an extension of the Contract Time, the sole remedy of the Contractor shall be such extension of the Contract Time and the Contractor shall not be entitled to any adjustment of the Contract Sum, except as otherwise provided in the following sentence. If and to the extent that the Contract Time is extended by more than ten (10) business days solely on account of fault or neglect of the Owner or Architect, the Contract Sum shall be increased by the Contractor’s reasonable and verified additional direct out of pocket costs of performing the Work to the extent directly and solely attributable to extensions of the Contract Time on account of the fault or neglect of the Owner or Architect in excess of ten (10) business days.

§ 8.3.7 The Owner and Contractor agree that it is the intent of the Contract Documents that the Contractor shall have responsibility to achieve Substantial Completion of the Work within the Contract Time with an adequate work force, irrespective of any labor dispute (other than those of general applicability not directed at the Project, the Contractor or anyone for whom the Contractor is responsible), including picketing at or near the Project site, whether or not the Contractor is the primary employer involved in the labor dispute or a neutral employer, and whether or not the Contractor has a collective bargaining relationship with the union(s) involved in the labor dispute. Notwithstanding anything to the contrary in any of the Contract Documents, the Contractor acknowledges and agrees that no extension of time shall be granted on account of a labor dispute (other than those of general applicability not directed at the Project, the Contractor, or anyone for whom the contractor is responsible).

§ 8.3.8 If the Contractor submits a progress report indicating, or otherwise expresses an intention to achieve, completion of the Work prior to any completion date required by the Contract Documents or expiration of the Contract Time, no liability of the Owner to the Contractor for any failure of the Contractor to so complete the Work shall be created or implied.
ARTICLE 9  PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM
The Contract Sum is stated in the Agreement and, including authorized adjustments, is the maximum amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents. The Contractor shall provide to the Owner, throughout the course of the Work, reports projecting the cash flow needs of the Contractor. This report shall be prepared and delivered monthly, projecting the anticipated needs for the balance of the Project.

§ 9.2 SCHEDULE OF VALUES
Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Owner and Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require and shall be revised if later found by the Architect to be inaccurate. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor’s Applications for Payment. Each item in the schedule of values shall be exclusive of the Contractor’s Fee. The proper share of the Contractor’s Fee for each item shall be listed in a separate line or column.

§ 9.3 APPLICATIONS FOR PAYMENT
§ 9.3.1 At the time or times established in the Agreement for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2., for completed portions of the Work. The format and number of copies of such Applications for Payment shall be as directed by the Owner. Such application shall be notarized, if required, and supported by such data substantiating the Contractor’s right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents. Each Application for Payment shall be accompanied by the following, all in form and substance satisfactory to the Owner: (i) a current Contractor’s lien waiver and duly executed and acknowledged sworn statement showing all Subcontractors and material suppliers with whom the Contractor has entered into subcontracts, the amount of each such subcontract, the amount requested for any Subcontractor and material supplier in the requested progress payment, together with similar sworn statements from all such Subcontractors and material suppliers; (ii) duly executed waivers of mechanics’ and material suppliers’ liens from all Subcontractors and, when appropriate, from material suppliers and lower tier Subcontractors establishing payment or satisfaction of payment of all amounts requested by the Contractor on behalf of such entities or persons in any previous Application for Payment; (iii) proof of compliance with insurance and surety provisions as outlined in this Agreement; (iv) an updated Schedule that accurately reflects the current status of the Project; and (v) all information and materials required to comply with the requirements of the Contract Documents or reasonably requested by the Owner or the Architect.

§ 9.3.1.1 As provided in Section 7.9.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders when such Construction Change Directives have set forth an adjustment to the Contract Sum.

§ 9.3.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner’s title to such materials and equipment or otherwise protect the Owner’s interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.
§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor’s knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.3.4 Contractor shall maintain record drawings as required by the Contract Documents, including for the mechanical and electrical trades, and shall review and inspect such drawings on a monthly basis. Contractor shall, on a monthly basis provide to Owner written confirmation that the record drawings are current.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor’s Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect’s reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect’s evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect’s knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor’s right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect’s opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect’s opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

.1 defective Work not remedied;
.2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by Contractor, including subcontractor and/or supplier lien claims which have not been dissolved by bond by operation of law by the Contractor;
.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a separate contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.
.8 failure to maintain current record drawings.
§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS
§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor’s portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 Intentionally omitted.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, sub-subcontractor, or vendor.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT
If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within fourteen (14) days after receipt of the Contractor’s Application for Payment, or if the Owner does not pay the Contractor within fourteen (14) days after the date established in the Contract Documents the amount certified by the Architect, then the Contractor may, upon fourteen (14) additional days’ written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor’s reasonable costs of shut-down, delay and startup, plus interest as provided for in the Contract Documents.

§ 9.8 SUBSTANTIAL COMPLETION
§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficient complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use and only minor items which can be corrected or completed without any material interference with the Owner’s use of the Work which remains to be corrected or completed. Further, the following items are required from the Contractor prior to the Owner’s issuing of the Certificate of Substantial Completion: (i)
the Owner and Architect agree that the Project is ready for the use intended without any concurrent Work that will disrupt the Owner's activities; (ii) the Owner and the Architect agree that the Work has been completed in accordance with the Contract Documents, specifications, plans, drawings and all Change Orders; (iii) all HVAC systems included in the Work are functioning in accordance with the Contract Documents and a satisfactory test and balance report for said systems has been received by the Architect; (iv) all life safety systems included in the Work are functioning in accordance with the Contract Documents; (v) receipt by the Architect of the list of all outstanding Work that shall become the Punch List; and (vi) receipt by the Owner of all required final certifications and/or approvals from the governmental authorities having jurisdiction over the Work.

§ 9.8.2 Intentionally omitted.

§ 9.8.3 Upon receipt of the Contractor’s list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect’s inspection discloses any item, whether or not included on the Contractor’s list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage. Such partial occupancy or use may begin whether or not the portion is substantially complete, provided the respective responsibilities of Owner and Contractor for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have been established in writing and approval by municipal authorities, if applicable, is granted. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor’s written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect’s knowledge, information and belief, and on the basis of the Architect’s on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect’s final Certificate for Payment will
constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor’s being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner’s property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days’ prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) waivers of liens, in the form provided by the Owner, from the Contractor and all Subcontractors and suppliers who performed portions of the Work or supplied materials or equipment in connection with the Work, (6) the expiration of time within which any Contractor, Subcontractor or supplier could file a lien under law, (7) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner, (8) to the extent that final certificate(s) of occupancy for the Project and the certificates of inspection and operating permits described in Section 13.5.4 are required by governmental authorities to use and occupy the Project as intended, and in the event that such items were not delivered to the Owner as a condition to Substantial completion of the Work, the final certificate(s) of occupancy for the Project and the certificates of inspection and operating permits described in Section 13.5.4, (9) the As-Built Documents and reproducible transparencies thereof, in accordance with Section 3.11. (10) all special warranties required by the Contract Documents, endorsed by the Contractor and in a form reasonably acceptable to the Architect and the Owner, and (11) all manufacturers’ catalogs, instructions, and other similar data, including the necessary graphic cuts, diagrams, value charts, and the like, covering all mechanical and manually operated devices furnished and/or installed in any permanent structure. All of the foregoing items shall be submitted to the Owner in a single binder (the “Project Binder”), and the Contractor shall submit to the Owner four (4) copies of the Project Binder. As an additional condition to be satisfied prior to final payment, the Contractor’s personnel or Subcontractors’ or suppliers’ personnel, as appropriate, shall provide the property management and operations personnel at the Property with training in the operation and maintenance of building systems and controls installed as part of the Work. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys’ fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

1. liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
2. failure of the Work to comply with the requirements of the Contract Documents; or
3. terms of special warranties required by the Contract Documents.
4. any Claim which has not been waived in accordance with this Agreement shall be deemed to have accrued upon discovery by the Owner of the condition or breach upon which such Claim is based, for the purpose of any applicable statute of limitation.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.
ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY
§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS
The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY
§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to
   .1 employees on the Work and other persons who may be affected thereby;
   .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor’s Subcontractors or Sub-subcontractors; and
   .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor’s obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor’s organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor’s superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services, and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits, including all storage areas, shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.

§ 10.2.9 The Contractor is responsible for maintaining the area within the site limits free of all debris and food-related trash that may harbor and/or attract rodents. The Contractor shall provide secure refuse containers for all food-related trash. The containers shall be heavy-duty refuse containers with tight-fitting domed lids, with a spring loaded flap, and no opening that allow access by rodents. The Contractor shall notify the Owner immediately whenever rodents or signs of rodents (e.g., burrows, droppings) are observed.
§ 10.2.10 The Contractor shall at all times protect excavations, trenches, buildings and materials, from rain water, ground water, backup or leakage of sewers, drains and other piping, and from water of any other origin and shall remove promptly any accumulation of water. The Contractor shall provide and operate all pumps, piping and other equipment necessary to this end.

§ 10.2.11 The Contractor shall take reasonable precautions to prevent loss or damage caused by vandalism, theft, burglary, pilferage or unexplained disappearance of property of the Owner, whether or not forming part of the Work, located within those areas of the Project to which the Contractor has control.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions and normal and/or customary construction practices will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor’s written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the contract documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor’s reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 Owner agrees to indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect’s consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including reasonable attorneys’ fees arising out of or resulting from the Work in the affected area if: i) in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless; and ii) owner knowingly failed to disclose the presence of such material or substance; and iii) that such claim, damage, loss or expense is attributable to bodily injury, sickness, death, or injury to or destruction of tangible property (other than the Work itself) is found to be caused by the presence of such material or substance and except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site.

§ 10.3.4.1 Hazardous waste that is generated by the Contractor as part of the Work shall be stored and disposed of in accordance with all applicable Federal, State and local regulations. Hazardous waste storage requirements include, but are not limited to, secondary containment, proper labeling, segregation of incompatible materials and routing.
inspection of storage areas. In addition, all hazardous waste containers shall be constructed of a material that is compatible with the waste, shall be in sound condition, and shall be kept securely closed at all times.

§ 10.3.4.2 The Contractor is responsible for the proper removal and disposition of all surplus chemicals (e.g., paints, lubricants, cleaning products) that they bring on-site as part of the Work. The Contractor shall not use any drain, pipe or plumbing fixture for the disposal of any waste materials. No chemicals that the Contractor brings on-site shall remain on the Project site at the completion of the Work.

§ 10.3.4.3 To ensure that construction activities and the use of heavy equipment does not increase the risk of release of oil or hazardous materials to the environment, the Contractor shall have and implement a Spill Plan that reflects all regulatory standards. The Contractor shall immediately report all spills/releases to the Owner. The Contractor shall coordinate with the Owner regarding reporting and follow-up documentation to outside regulatory agencies.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner’s fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance outside the scope of its Work solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 10.3.7 Notwithstanding anything to the contrary, the Contractor acknowledges and agrees that the Work will likely require the removal and/or remediation of soil, debris and other items containing hazardous materials or contaminants to the extent disclosed in reports or materials previously delivered to the Contractor. All such Work shall be performed, and all such materials shall be removed and disposed of, by qualified and licensed (where required) parties engaged by the Contractor in compliance with all applicable legal requirements.

§ 10.4 EMERGENCIES
In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor’s discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS
§ 11.1 CONTRACTOR’S LIABILITY INSURANCE
§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies acceptable to Owner and lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims which may arise out of or result from the Contractor’s operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. Such insurance shall include, at a minimum, the following:

§ 11.1.1.1
The Contractor shall maintain the insurance coverages set out in this Section, insuring the Contractor and its employees, agents, and designees, which insurance shall be by policies that are subject to the Owner’s approval:

a.      Workers’ Compensation Insurance to cover full liability under the Workers’ Compensation laws of the state or jurisdiction in which the Project is located at the statutory limits required in said jurisdiction, including coverage for the benefits provided under United States Longshoremens’ & Harbor Workers’ Act, if applicable.

b.      Employers’ Liability Insurance (with limits of not less than $500,000 per accident for Bodily Injury by accident, $500,000 each employee - by disease and $500,000 policy limit - by disease), covering operations of the Contractor.
c. Commercial General Liability ("CGL") Insurance for operations of the Contractor with coverage written at least as broad as that of the standard Commercial General Liability Insurance policy (Occurrence Form) including hazards of operations (including explosions, collapse, and underground operations), with contractual liability coverage and personal injury liability coverage for claims arising out of this Agreement. The insurance required by this subsection (c) shall be written for not less than limits of liability as follows: $1,000,000 each occurrence for bodily injury and property damage; $2,000,000 general aggregate; and $2,000,000 aggregate products/completed operations. CGL coverage shall be written on ISO Occurrence Form CG 00 01 (10 01) or a substitute form providing equivalent coverage and shall cover liability arising from premises, operations, independent contractors, products, completed operations, and personal and advertising injury.

d. Automobile Liability Insurance covering all owned non-owned and hired automobiles, trucks, and trailers of the Contractor. Such insurance coverage shall be written at least as broad as that of the Standard Commercial Automobile Liability policy and be written for not less than a $1,000,000 limit of liability per occurrence for bodily injury and property damage.

e. Should aircraft or watercraft of any kind be used by Contractor, any tier of Subcontractor or by anyone else on their behalf, Contractor or Subcontractor shall maintain or cause the operator of the aircraft/watercraft to maintain Aircraft/Watercraft Public Liability Insurance including bodily injury, property damage, and passenger liability, with respect to any aircraft/watercraft owner, used, operated or hired in connection with the Work the Contractor, Subcontractor or anyone else written for not less than a $5,000,000.00 limit of liability per occurrence for bodily injury and property damage.

f. Should the performance of this Agreement require the Contractor, any tier of subcontractor or anyone else on their behalf to conduct any activities in the vicinity of a railroad, the Contractor or Subcontractor shall maintain such Railroad Protective Insurance as may be required by the affected railroad written for not less than the limits required by such railroad. The Contractor’s Railroad Protective Insurance shall be written on the policy form required by the affected railroad.

g. Excess or Umbrella Liability Insurance with coverage written at least as broad as those of the primary policies required by this Subsection (b), (c), (d) and (e) above and written for not less than a $10,000,000 limit of liability per occurrence.

§ 11.1.1.2 Each insurance policy to be maintained under the prior Section, subparts (b), (c), (d), (e), (f), and (g), shall be endorsed to name as Additional Insureds: the Owner, Owner’s Representative, Architect and the trustees, directors, officers, agents, consultants, servants and employees of each of them and all other interests as may be reasonably required by the Owner. Such parties shall be included as Additional Insureds on the CGL and Umbrella using ISO Additional Insured Endorsement CG 20 10 (11 85) or CG 20 33 (10 01) AND CG 20 37 (10 01) or an endorsement providing equivalent coverage to the additional insureds. This insurance for the Additional Insureds shall be as broad as the coverage provided for the named insured. Such insurance shall apply as primary and non-contributing insurance before any other insurance or self-insurance, including any deductible, maintained by, or provided to, the Additional Insured. If the Additional Insureds have other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis and apply to the Additional Insureds only. The amount of Contractor's insurance shall not be reduced by the existence of such other insurance. All Subcontractors shall provide endorsements naming the Contractor, the Owner, Owner’s Representative, Architect, and any lenders of Owner and all other parties required by this Agreement as “Additional Insureds” on their CGL and Umbrella policies using the same ISO forms or combinations of forms. Contractor and all Subcontractors shall maintain CGL and Umbrella coverage for themselves and all additional insureds for the duration of the Work and maintain Completed Operations coverage for themselves and the Additional Insureds for at least one (1) year after Substantial Completion of the Work.

§ 11.1.1.3 Prior to the date on which Contractor commences the performance of the Work, the Contractor shall cause to be furnished to the Owner the Certificate of Insurance for the coverages required by this Agreement to be maintained by Contractor with insurance carriers acceptable to the Owner. As and when the Owner may direct, copies of the actual insurance policies or renewals or replacements thereof shall be submitted to the Owner. All policies of insurance, if any, and Certificates of Insurance submitted to the Owner shall be in form and content acceptable to the Owner. In the event Contractor maintains insurance with limits exceeding the limits required.
hereunder, the Certificate of Insurance shall state the full extent of the coverage available to the above Additional Insureds. Such excess liability coverage will inure to the benefit of the Additional Insureds in the event of loss in excess of the minimum insurance required herein. Contractor will obtain and maintain copies of Certificates of Insurance from all Subcontractors.

§ 11.1.1.4 Contractor shall require all policies of insurance that are secured and maintained by Contractor to include clauses providing that each carrier shall waive all of its rights of recovery, under subrogation or otherwise, against the Owner, Owner’s Representative, Architect and their affiliates. In addition, Contractor waives all rights of recovery against the Owner, Owner’s Representative and/or Architect it may have or acquire because of deductible clauses in or inadequacy of limits of any policies of insurance that are in any way related to the Work or activities of Contractor. Nothing contained herein shall relieve contractor from its obligations to exercise due care in the performance of its duties in under this Contract. If the Contractor fails to furnish and maintain the required insurance, the Owner may, at its option, purchase such insurance on behalf of the Contractor, and Contractor shall pay the cost thereof to the Owner upon demand and shall furnish to the Owner any information needed to obtain such insurance.

§ 11.1.2 Intentionally omitted.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days’ prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness. These certificates shall set forth evidence of all coverage required by Section 11.1.1. The form of certificates shall be the ACCORD form. Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending limits of coverage.

§ 11.1.4 Intentionally omitted.

§ 11.2 OWNER’S LIABILITY INSURANCE
The Owner shall be responsible for purchasing and maintaining the Owner’s usual liability insurance.

§ 11.3 PROPERTY INSURANCE
§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder’s risk “all-risk” or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Builders Risk Property insurance shall be provided by the Owner and be an “all-risk” or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect’s and Contractor’s services and expenses required as a result of such insured loss. The Owner’s property insurance will not cover hoists, tools, or other equipment belonging to the Contractor or any Subcontractor.
§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles unless such loss is due to the fault or neglect of Contractor or a party for whom Contractor is responsible.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE
The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE
The Owner, at the Owner’s option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner’s property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner’s property, including consequential losses due to fire or other hazards however caused to the extent covered by insurance.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 Intentionally omitted.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days’ prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION
The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect’s consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect’s consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even
though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner’s property insurance shall be adjusted by the Owner in good faith and made payable to the Owner for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 Intentionally omitted.

§ 11.3.10 The Owner shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner’s exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract. The cost of all bonds shall be included in the Construction Managers Fee. If the construction manager requires bonding of subcontractors, this cost shall be noted as a separate cost item on the subcontractors bid and contract. The owner shall have the right to reject the bond cost for subcontractors as a cost of the work and require the construction manager to carry the cost as part of the base fee.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.5.1.1 In addition, should anyone claiming by, through or under Contractor assert a mechanic’s lien on the Project alleging non-payment for work, labor and materials or other similar claims regarding the Project, Contractor shall be obligated to obtain a bond pursuant to applicable law, or if acceptable to Owner, other lawful and satisfactory security, to discharge said lien and to clear the title of the Project.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect’s request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect’s examination and be replaced at the Contractor’s expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner’s expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor’s expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect’s services and expenses made necessary thereby, and any cost, expenses, loss or damages to the Owner resulting from such failure or defect, shall be at the Contractor’s expense.
§ 12.2.2 AFTER SUBSTANTIAL COMPLETION
§ 12.2.2.1 In addition to the Contractor’s obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4. This obligation under the Section 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work. This obligation under this Section 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract.

§ 12.2.2.3 Intentionally omitted.
§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor’s correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor’s liability with respect to the Contractor’s obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK
If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable, but in such event, the Owner’s acceptance shall not be deemed a waiver of any other rights the Owner has hereunder. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS
§ 13.1 GOVERNING LAW
The Contract shall be governed by the law of the place where the Project is located.

§ 13.2 SUCCESSORS AND ASSIGNS
§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other; provided, however, that either party may assign this Agreement or any rights acquired hereunder without the other party’s consent if such assignment is to any corporation or entity which may hereafter become the party’s successor-in-interest or which purchases all or substantially all of the party’s assets. In the event an assignment is approved, the assignee must expressly assume all obligations and liabilities of the assignor hereunder, and such assignment will not relieve the assignor of its obligations hereunder. Any attempt at assignment without the consent of the other party as provided herein shall be deemed null and void and a material breach of this Agreement. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.
§ 13.2.2 Notwithstanding the foregoing, the Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE
Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES
§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS
§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST
Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
§ 13.7 TIME LIMITS ON CLAIMS
The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT
§ 14.1 TERMINATION BY THE CONTRACTOR
§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:
   .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
   .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;
   .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
   .4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor’s request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days’ written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner’s obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days’ written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE
§ 14.2.1 The Owner may terminate the Contract if the Contractor
   .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
   .2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
   .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
   .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor’s surety, if any, seven days’ written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:
   .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
   .2 Accept assignment of subcontracts pursuant to Section 5.4; and
Contractor shall first provide initial notice of a delay within 3 days of the event giving rise to the delay, and then provide a Claim within such 21 day period thereafter; and further provided, however, that the Contractor shall use its best efforts to furnish the Architect and the Owner, as expeditiously as possible, with notice of any Claim including, without limitation, those in connection with concealed or unknown conditions, once such Claim is recognized, and shall cooperate with the Architect and the Owner in an effort to mitigate the alleged or potential damages, delay or other adverse consequences arising out of the condition which is the cause of such a Claim. THE CONTRACTOR EXPRESSLY AGREES THAT FAILURE OF THE CONTRACTOR TO INITIATE A CLAIM WITHIN THE TIME LIMITS SPECIFIED IN THIS SECTION 15.1.2 SHALL RESULT IN SUCH CLAIM BEING WAIVED.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE
Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments that are not in dispute in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST
If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided in Section 15.1.2 shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME
§ 15.1.5.1 Contractor shall advise the Owner and Architect in writing of any known delay within three (3) days of its knowledge of the same (including delays in the receipt of drawings or designs from designer or Architect), and shall include an identification of the delay, its anticipated duration and its anticipated effect on the prosecution and completion of the Work. If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided in Section 15.1.2 shall be given. The Contractor’s Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary. The Contractor shall have the burden of demonstrating the effect of the claimed delay on the Contract Time, and shall furnish the Owner and Architect with such documentation relating thereto as they may reasonably require. The Contractor shall take all prudent steps necessary to minimize the delay, and shall diligently proceed to complete the Work as required by the Contract Documents. Notwithstanding the foregoing, time for performance of a party’s obligations hereunder shall not be tolled unless and until the party claiming such excuse has provided the other party with written notice of the event.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction. Claims arising from adverse weather conditions shall be subject to the provisions of Section 8.3.5.

§ 15.1.6 Intentionally omitted.

§ 15.1.7 No extension of time shall be granted to the Contractor for delays occurring to parts of the Work that have no measurable impact on the completion of the Milestone Dates; nor shall any extension of time be granted for delays to parts of the Work that are not located on the critical path. The Contractor acknowledges and agrees that an excusable delay in a portion of the Work or schedule activity does not necessarily result in a delay of equal duration in the completion of the entire Project.

§ 15.1.8 Direct Negotiation. Any dispute arising at any time during or after the construction of the Project shall be resolved, if possible, by negotiations between duly authorized representatives of the Contractor and the Owner. If such duly authorized representatives are unable to resolve any dispute within ten (10) days after written notice of such dispute together with all relevant supporting documentation is given by either party to the other, the matter may be submitted by either party to the dispute resolution process set forth below.

§ 15.2 INITIAL DECISION
§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise
indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker’s sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner’s expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor’s default, the Owner may, but is not obligated to, notify the surety and request the surety’s assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic’s lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation.
The request may be made concurrently with the filing of a civil action but, in such event, mediation shall proceed in advance of such civil action, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 LITIGATION AND ARBITRATION
§ 16.4.1 Any dispute that is not resolved by negotiation or mediation or arbitration shall be resolved by litigation in state or federal court. Contractor waives to jurisdiction in the state or federal courts of New Hampshire and agrees that the sole venue of any litigation between Contractor and Owner shall be Hillsborough County, New Hampshire. To the extent, the parties have agreed in the Owner-Contractor Agreement that claims below a certain dollar threshold shall be decided by binding arbitration, such arbitration shall be conducted and the arbitrator(s) selected in accordance with the Construction Industry Rules of the American Arbitration Association then pertaining unless the parties mutually agree otherwise.
PART 1 GENERAL

1.01 PROJECT IDENTIFICATION
   A. Project Name: MCC Welding Addition, located at 1066 Front St, Manchester, NH.
   B. Project Number: 3043.
   C. The Owner, hereinafter referred to as Owner: Manchester Community College c/o Sarah Diversi, CFO.

1.02 NOTICE TO PROSPECTIVE BIDDERS
   A. These documents constitute an Invitation to Bid to General Contractors for the construction of the project described below.

1.03 PROJECT DESCRIPTION
   A. Summary Project Description: Minor Renovations and MEP work to the existing welding classroom and a new 4,000 square foot addition expanding the classroom area, as well as associated sitework to accomplish the scope of work.
   B. Contract Scope: Construction, demolition, and renovation.

1.04 PROJECT CONSULTANTS
   A. The Architect, hereinafter referred to as Architect: Warrenstreet Architects, Inc.
      1. Address: 27 Warren St.
      2. City, State, Zip: Concord, NH 03301.

1.05 PROCUREMENT TIMETABLE
   A. Pre-Bid (Non_Mandatory) Briefing: Tuesday July 10, 2012 at 10:00am.
   B. Last Request for Substitution Due: 7 days prior to due date of bids.
   C. Last Request for Information Due: 7 days prior to due date of bids.
   D. Anticipated Bid Due Date: Friday July 20, 2012, before 2 PM local time.
   E. Bid Opening: Same day, 2 PM local time.
   F. Notice to Proceed: Within 7 days after due date.
   G. Bids May Not Be Withdrawn Until: 30 days after due date.
   I. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

1.06 PRE-QUALIFIED BIDDERS
   A. Those already qualified to submit bids are:
      1. NH Department of Transportation Qualified General Contractors.

1.07 PROCUREMENT DOCUMENTS
   A. Availability of Documents: Complete sets of procurement documents may be obtained:
      1. From Owner at the MCC Website: http://www.mccnh.edu/
B. Documents are on display at the offices of the following construction plan rooms:
   1. Signature Press and Blueprinting, Inc., 45 Londonderry Turnpike, Rte. 28 Bypass, Hooksett, NH 03106;
   2. Reed Construction Data, 30 Technology Parkway South Suite 100 Norcross GA., 30092
   3. Construction Summary of NH: Inc., 734 Chestnut Street, Manchester, NH 03104;
   4. Infinite Imaging: 933 Islington Street, Portsmouth, NH 03801
   5. McGraw-Hill Construction, Dodge Plan Room: 880 Second Street, Manchester, NH 03102;
   6. Minuteman Press: 109 Gosling Road, Newington, NH 03801;
   7. Works in Progress, 20 Farrell Street, Suite 103, South Burlington, VT 05403
   8. Signature Press and Blueprinting, Inc., 45 Londonderry Turnpike, Rte. 28 Bypass, Hooksett, NH 03106;
   9. Reed Construction Data, 30 Technology Parkway South Suite 100 Norcross GA., 30092
10. Construction Summary of NH: Inc., 734 Chestnut Street, Manchester, NH 03104;
11. Infinite Imaging: 933 Islington Street, Portsmouth, NH 03801
12. McGraw-Hill Construction, Dodge Plan Room: 880 Second Street, Manchester, NH 03102;
13. Minuteman Press: 109 Gosling Road, Newington, NH 03801;
14. Works in Progress, 20 Farrell Street, Suite 103, South Burlington, VT 05403

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION
SECTION 000115
DRAWING LIST

CIVIL
EXISTING CONDITIONS PLAN C-01
SITE PREPARATION PLAN C-02
SITE LAYOUT PLAN C-03
GRADING & DRAINAGE PLAN C-04
UTILITY PLAN C-05
LANDSCAPE PLAN C-06
STORM WATER MANAGEMENT PLAN C-07
DETAIL SHEET C-08
DETAIL SHEET C-09
DETAIL SHEET C-10

ARCHITECTURAL
GENERAL NOTES A0.1
OUTLINE SPECIFICATION & MATERIAL LIST A0.2
ADA, CONVERSIONS, SYMBOLS, SIGNAGE, & ABBREVIATIONS A0.3
CODE REVIEW A0.4
PARTITION TYPES A0.5
EXISTING CONDITIONS & DEMOLITION A1.1
PROPOSED GROUND LEVEL FLOOR PLAN A1.2
PROPOSED MEZZANINE LEVEL FLOOR PLAN A1.3
DIMENSION FLOOR PLAN A1.4
EQUIPMENT PLAN A1.5
REFLECTED CEILING PLAN A1.6
ROOF PLAN A1.7
DOOR, WINDOW, & FINISH SCHEDULE A2.1
BUILDING ELEVATIONS A3.1
BUILDING ELEVATIONS A3.2
BUILDING ELEVATIONS A3.3
BUILDING SECTIONS A4.1
WALL SECTIONS A4.2
WALL SECTIONS A4.3
DETAILS A5.1

STRUCTURAL
STRUCTURAL GENERAL NOTES S0.1
FOUNDATION AND ROOF FRAMING PLANS S1.0
STRUCTURAL ROOF JOIST LOADING AND DETAILS S1.1
STRUCTURAL DETAILS S2.0
STRUCTURAL FRAMING SECTIONS S3.0
STRUCTURAL FRAMING SECTIONS S3.1

MECHANICAL
PART PLANS – MECHANICAL DEMOLITION MD1.1
GROUND FLOOR PART PLAN – MECHANICAL M1.1
MEZZANINE FLOOR PART PLAN – MECHANICAL M1.2
ROOF PART PLAN – MECHANICAL M1.3
MECHANICAL DETAILS M5.1
MECHANICAL EQUIPMENT SCHEDULES M6.1

DRAWING LIST 000115 - 1
PLUMBING

GROUND FLOOR PART PLAN – PLUMBING DEMOLITION PD1.1
PLUMBING FIXTURE SCHEDULE, LEGEND AND DETAILS P0.1
GROUND FLOOR PART PLAN – PLUMBING P1.1
GROUND FLOOR PART PLAN – PLUMBING P1.2

FIRE PROTECTION

GROUND FLOOR PART PLAN – FIRE PROTECTION OUTLINE FP1.1

ELECTRICAL

GROUND FLOOR PART PLAN – ELECTRICAL DEMOLITION ED1.1
MEZZANINE FLOOR PART PLAN – ELECTRICAL DEMOLITION ED1.2
ELECTRICAL NOTES, LEGENDS & SYMBOLS E0.1
GROUND FLOOR PART PLAN – LIGHTING E1.1
MEZZANINE FLOOR PART PLAN – LIGHTING E1.2
GROUND FLOOR PART PLAN – POWER AND SYSTEMS E1.3
MEZZANINE FLOOR PART PLAN – POWER AND SYSTEMS E1.4
ELECTRICAL DETAILS AND SCHEDULES E4.1
PARTIAL RISER AND SCHEDULES E5.1
SECTION 00 2113

INSTRUCTIONS TO BIDDERS

SUMMARY

1.01 DOCUMENT INCLUDES

A. Invitation
   1. Bid Submission
   2. Intent
   3. Work Identified in the Contract Documents
   4. Contract Time

B. Bid Documents and Contract Documents
   1. Definitions
   2. Examination

C. Site Assessment
   1. Site Examination
   2. Prebid Conference

D. Qualifications
   1. Prequalification

E. Bid Submission
   1. Bid Depository
   2. Submission Procedure
   3. Bid Ineligibility

F. Bid Enclosures/Requirements
   1. Security Deposit
   2. Bid Form Requirements
   3. Bid Form Signature

G. Offer Acceptance/Rejection
   1. Duration of Offer
   2. Acceptance of Offer

INVITATION

2.01 BID SUBMISSION

A. Bids signed and under seal, executed, and dated will be received at the office of the Owner Manchester Community College. 1066 Front St, Manchester, NH, Office of the President before 2 - two p.m. local standard time on the 20- twentieth day of July, 2012.

2.02 INTENT

A. The intent of this Bid request is to obtain an offer to perform work to complete a renovation and construct an addition located at the MCC Campus for a Stipulated Sum contract, in accordance with the Contract Documents.

2.03 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

A. Work of this proposed Contract comprises building construction, site development, renovation, and demolition, including general construction, structural, mechanical, and electrical Work.

2.04 CONTRACT TIME

A. Owner requires that under the work of this contract be completed as quickly as possible and
consideration will be given to time of completion when reviewing the submitted bids. Electrical work connecting existing equipment in the existing welding classroom needs to be complete by August 31, 2012. The Addition need to be substantially complete with occupancy permit by January 15, 2013.

BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 DEFINITIONS
A. Bid Documents: Contract Documents supplemented with AIA 201 General Conditions Supplements To Bid Forms and Appendices identified.

3.02 CONTRACT DOCUMENTS IDENTIFICATION
A. The Contract Documents are identified as Project Number MC12-07, as prepared by Architect who is located at 27 Warren St, Concord, NH 03301, and with contents as identified in the Table of Contents.

3.03 AVAILABILITY
A. Bid documents may be obtained at the establishments noted in the Invitation to Bid.

3.04 EXAMINATION
A. Bid Documents may be viewed at the office of Architect.
B. Bid Documents are on display at the offices of the following construction plan rooms:
   1. those establishments noted in the Invitation to Bid.
C. Upon receipt of Bid Documents verify that documents are complete. Notify Architect should the documents be incomplete.
D. Immediately notify Architect upon finding discrepancies or omissions in the Bid Documents.

3.05 INQUIRIES/ADDITIONA
A. It is the responsibility of the General Contractor to register my email with the architect to insure receipt of addenda. Direct questions to Jonathan Halle, AIA, email: jh@warrenstreet.coop.
B. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.
C. Verbal answers are not binding on any party.
D. Clarifications requested by bidders must be in writing not less than 7 days before date set for receipt of bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients.

3.06 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS
A. Substitute products will be considered if submitted as an attachment to the Bid Form. Approval to submit substitutions prior to submission of bids is not required.
B. In submission of substitutions to products specified, bidders shall include in their bid all changes required in the Work and changes to Contract Time and Contract Sum to accommodate such substitutions. A later claim by the bidder for an addition to the Contract Time or Contract Sum because of changes in work necessitated by use of substitutions shall not be considered.
C. The submission shall provide sufficient information to determine acceptability of such products.
D. Provide complete information on required revisions to other work to accommodate each proposed substitution.
E. Provide products as specified unless substitutions are submitted in this manner and accepted.
SITE ASSESSMENT

4.01 SITE EXAMINATION
   A. Examine the project site before submitting a bid.
   B. A visit to the project site has been arranged for bidders as follows: on Tuesday July 10, 2012 at 10am.

4.02 PREBID CONFERENCE
   A. A bidders conference has been scheduled for 10 ten a.m. on the 10 tenth day of July, 2012 at the location of the project.

QUALIFICATIONS

5.01 EVIDENCE OF QUALIFICATIONS
   A. To demonstrate qualification for performing the Work of this Contract, bidders may be requested to submit written evidence of being certified by the NH DOT as a prequalified contractor, current financial position and current commitments.

5.02 SUBCONTRACTORS/SUPPLIERS/OTHERS
   A. Owner reserves the right to reject a proposed subcontractor for reasonable cause.

BID SUBMISSION

6.01 BID DEPOSITORY

6.02 SUBMISSION PROCEDURE
   A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.
   B. Submit one copy of the executed offer on the Bid Forms provided, signed and sealed with the required security in a closed opaque envelope, clearly identified with bidder's name, project name and Owner's name on the outside.

6.03 REJECTION OF BID
   A. The Chancellor reserves the right to reject any and all Bids, to waive technicalities or to advertise for new Bids. In his/her judgement, the best interest of the Community College System of NH will be promoted thereby. The Chancellor reserves the right to reject the Bid of a Bidder who is deemed not in the position to perform the Contract. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Chancellor, be declared unacceptable.
   B. Bid Forms, Appendices, and enclosures that are improperly prepared may, at the discretion of Chancellor, be declared unacceptable.
   C. Failure to provide security deposit, bonding or insurance requirements may, at the discretion of Chancellor, be waived.

BID ENCLOSURES/REQUIREMENTS

7.01 SECURITY DEPOSIT
   A. Bids shall be accompanied by a Proposal Gauranty as follows:
      1. Bid Bond of a sum no less than 5 percent of the Bid Amount.
   B. Endorse the Bid Bond in the name of the "Tresurer - State of New Hampshire" as obligee, signed and sealed by the principal (Contractor) and surety.
C. The security deposit will be returned after delivery to the Owner of the required Performance and Payment Bond(s) by the accepted bidder.
D. Include the cost of bid security in the Bid Amount.
E. If no contract is awarded, all security deposits will be returned.

7.02 PERFORMANCE ASSURANCE
   A. Accepted Bidder: Provide a 100% Performance and Payment bond as described in Document 00 7300 - Supplementary Conditions.

7.03 INSURANCE
   A. Provide an executed "Undertaking of Insurance" on a standard form provided by the insurance company stating their intention to provide insurance to the bidder in accordance with the insurance requirements of the Contract Documents.

   B. NO OPERATIONS SHALL COMMENCE UNTIL CERTIFICATES OF INSURANCE ATTESTING TO THE FOLLOWING LIMITS HAVE BEEN FILED WITH THE CHANCELLOR, APPROVED BY THE COLLEGE AND A NOTICE TO PROCEED IS ISSUED.

THE CONTRACTOR SHALL PURCHASE THOSE COVERAGES IDENTIFIED BELOW BY AN "X" IN THE COLUMN TITLED "REQUIRED". REQUIRED LIMITS OF LIABILITY IN THOUSANDS <$000>.

GENERAL LIABILITY (OCCURRENCE / AGGREGATE)
X COMPREHENSIVE FORM - BODILY INJURY - $2,000 / $3,000
X PREMISES - OPERATIONS
X EXPLOSION AND COLLAPSE - PROPERTY DAMAGE HAZARD - $2,000 / $3,000
-------------------------------------------------- OR --------------------------------------------------
X UNDERGROUND HAZARD - BODILY INJURY &
X PRODUCTS/COMPLETED - PROPERTY DAMAGE - $2,000 / $3,000
X OPERATIONS HAZARD - COMBINED
X CONTRACTUAL INSURANCE
X BROAD FORM PROPERTY DAMAGE - PERSONAL INJURY - $2,000
X INDEPENDENT CONTRACTORS
X PERSONAL INJURY WITH EXCLUSION "C" ELIMINATED
AUTOMOBILE LIABILITY
X COMPREHENSIVE FORM - BODILY INJURY - $1,000
X OWNED (EACH PERSON)
X HIRED (BODILY INJURY) - $1,000
X NON-OWNED (EACH ACCIDENT)
-------------------------------------------------- OR --------------------------------------------------
PROPERTY DAMAGE - $1,000
-------------------------------------------------- OR --------------------------------------------------
BODILY INJURY &
PROPERTY DAMAGE - $1,000
COMBINED

EXCESS LIABILITY (THIS COVERAGE CAN SUPPLEMENT LIMITS IN ITEMS A, B, AND D TO SATISFY REQUIRED LIMITS).
X UMBRELLA FORM - $1,000
___ OTHER THAN UMBRELLA FORM
BODILY INJURY & PROPERTY DAMAGE COMBINED

WORKERS' COMPENSATION
X WORKER'S COMPENSATION - STATUTORY RSA281-A
X EMPLOYER'S LIABILITY - $100 (EACH ACCIDENT)

OTHER
X OWNER'S PROTECTIVE LIABILITY (COMBINED SINGLE) - $1,000
X BUILDER'S RISK (CONTRACT AMOUNT)
X BUILDING CONTENTS (SINGLE LIMIT)

AUTOMOBILE LIABILITY
X COMPREHENSIVE FORM - BODILY INJURY - $1,000
X OWNED (EACH PERSON)
X HIRED (BODILY INJURY) - $1,000
X NON-OWNED (EACH ACCIDENT)

PROPERTY DAMAGE - $1,000
------------- OR -------------
BODILY INJURY &
PROPERTY DAMAGE - $1,000
COMBINED

EXCESS LIABILITY (THIS COVERAGE CAN SUPPLEMENT LIMITS IN ITEMS A, B, AND D TO SATISFY REQUIRED LIMITS).
X UMBRELLA FORM - $1,000
___ OTHER THAN UMBRELLA FORM
BODILY INJURY & PROPERTY DAMAGE COMBINED

WORKERS' COMPENSATION

X WORKER'S COMPENSATION - STATUTORY RSA 281-A
X EMPLOYER'S LIABILITY - $100 (EACH ACCIDENT)

OTHER

X OWNER'S PROTECTIVE LIABILITY - (COMBINED SINGLE LIMIT) $1,000
X BUILDER'S RISK (CONTRACT AMOUNT)

73.01 BID FORM REQUIREMENTS

A. Complete all requested information in the Bid Form and Appendices.

73.02 FEES FOR CHANGES IN THE WORK

A. Include in the Bid Form, the overhead and profit fees on own Work and Work by subcontractors, applicable for Changes in the Work, whether additions to or deductions from the Work on which the Bid Amount is based.

73.03 BID FORM SIGNATURE

A. The Bid Form shall be signed by the bidder, as follows:
   1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Affix seal.
   2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Affix seal to each signature.
   3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.
   4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

73.04 ADDITIONAL BID INFORMATION

A. The lowest bidder will be requested to complete the Supplements To Bid Forms within 24 hours after submission of bids.
   B. Submit the following Supplements concurrent with bid submission:
      1. Document 00 4336 - Proposed Subcontractors: Include the names of all Subcontractors and the portions of the Work they will perform.
      2. Document 00 4323 - Alternates: Include the cost variation to the Bid Amount applicable to the Work described in Section ________.
      3. Document 00 4373 - Proposed Schedule of Values identifies the Bid Amount segmented into portions as requested.

73.05 SELECTION AND AWARD OF ALTERNATIVES
A. Bids will be evaluated on the total of the base bid price and all of the alternatives. After determination of the successful bidder, consideration will be given to which alternatives will be included in the Work.

**OFFER ACCEPTANCE/REJECTION**

**74.01 DURATION OF OFFER**

A. Bids shall remain open to acceptance and shall be irrevocable for a period of thirty (30) days after the bid closing date.

**74.02 ACCEPTANCE OF OFFER**

A. Owner reserves the right to accept or reject any or all offers.

B. After acceptance by Owner, Architect on behalf of Owner, will issue to the successful bidder, a written Bid Acceptance.

**END OF INSTRUCTIONS TO BIDDERS**
SECTION 00 4000

PROCUREMENT FORMS AND SUPPLEMENTS

PART 1  GENERAL

1.01 Contractor is responsible for obtaining a valid license to use all copyrighted documents specified but not included in the Project Manual.

1.02 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the procurement requirements.

B. Instructions to Bidders: AIA A701.

C. Bid Form: SECTION 00416.

1.03 REFERENCE STANDARDS

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION - NOT USED

END OF SECTION
SECTION 01 1000

SUMMARY

PART 1 GENERAL

1.01 PROJECT
A. Project Name: Manchester Community College Welding Lab Addition.
B. Owner's Name: Manchester Community College.
C. Architect's Name: Warrenstreet Architects, Inc.
D. The Project consists of the construction of a 4,000 square foot addition and renovations of existing welding classroom and associated sitework.

1.02 CONTRACT DESCRIPTION
A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

1.03 DESCRIPTION OF ALTERATIONS WORK
A. Scope of alterations work is shown on drawings.
B. Plumbing: Alter existing system and add new construction, keeping existing in operation.
C. HVAC: Alter existing system and add new construction, keeping existing in operation.
D. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation. All existing panels and rewiring of existing equipment must be completed by August 28, 2012.
E. Fire Suppression Sprinklers: Alter existing system and add new construction, keeping existing in operation.
F. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.

1.04 WORK BY OWNER
A. Owner has awarded a contract for supply of electrical panel boxes and covers which will be made available to the contractor.
B. Owner will supply and the contractor will install and connect all equipment shown on the plans in the area of the new addition. Equipment shown within the existing building has been relocated to final locations by the owner, this equipment does however need to be rewired for power.

1.05 OWNER OCCUPANCY
A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES
A. Construction Operations: Limited to areas noted on Drawings.
B. Arrange use of site and premises to allow for continued traffic to the north parking lot.
   1. Use of site and premises by the public.
C. Provide access to and from site as required by law and by Owner:
1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
2. Do not obstruct roadways, sidewalks, or other public ways without written approval of the Owner.

D. Time Restrictions:
1. Limit conduct of especially noisy exterior work to the hours of 8am to 5pm.

E. Utility Outages and Shutdown:
1. Limit disruption of utility services to hours the building is unoccupied.
2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
3. Prevent accidental disruption of utility services to other facilities.

1.07 WORK SEQUENCE

A. Construct Work in stages during the construction period:
1. Stage 1: Replace all existing main electrical panels and rewire all existing equipment within the existing classroom by August 28, 2012.
2. Stage 2: Construct addition.

B. Coordinate construction schedule and operations with Owner.

END OF SECTION
SECTION 01 2000

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.
B. Change procedures.

1.02 SCHEDULE OF VALUES

A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
B. Forms filled out by hand will not be accepted.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.
B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
C. Forms filled out by hand will not be accepted.
D. Execute certification by signature of authorized officer.
E. Submit three copies of each Application for Payment.

1.04 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to Contractor.
B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Price or Contract Time.
   2. Promptly execute the change.
C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within ____ days.
D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
E. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

END OF SECTION
SECTION 01 2100

ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contingency allowance.
B. Inspecting and testing allowances.
C. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CONTINGENCY ALLOWANCE

A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
B. Funds will be drawn from the Contingency Allowance only by Change Order.
C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 INSPECTING AND TESTING ALLOWANCES

A. Costs Included in Inspecting and Testing Allowances: Cost of engaging an inspecting or testing agency; execution of inspecting and tests; and reporting results.
B. Costs Not Included in the Inspecting and Testing Allowances:
   1. Costs of retesting upon failure of previous tests as determined by Architect.
C. Payment Procedures:
   1. Submit one copy of the inspecting or testing firm's invoice with next application for payment.

1.05 ALLOWANCES SCHEDULE

A. Soils Testing Allowance: Include the sum of $2,000.00 for testing compacted soils specified in Section 31 2200.
B. Concrete Testing Allowance: Include the sum of $1,500.00 for testing concrete specified in Section 03 3000.
C. Steel Welding Testing Allowance: Include the sum of $1,000.00 for testing structural welds specified in Section 05 1200.
D. HVAC Testing, Adjusting, and Balancing Allowance: Include the sum of $2,500.00 for testing, adjusting, and balancing mechanical systems as specified in Section 23 0583.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION
SECTION 01 2300

ALTERNATES

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Description of alternates.

1.02  RELATED REQUIREMENTS
A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for alternatives.

1.03  ACCEPTANCE OF ALTERNATES
A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted alternates will be identified in the Owner-Contractor Agreement.

1.04  SCHEDULE OF ALTERNATES
A. Alternate No. One - Install cementitious siding system over all exterior insulated panel walls as called for in the drawing package.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION - NOT USED

END OF SECTION
SECTION 01 3000

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electronic document submittal service.
B. Preconstruction meeting.
C. Site mobilization meeting.
D. Progress meetings.
E. Construction progress schedule.
F. Submittals for review, information, and project closeout.
G. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Document 00 7200 - General Conditions: Dates for applications for payment.
B. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.
C. Section 01 7800 - Closeout Submittals: Project record documents.

1.03 PROJECT COORDINATION

A. Project Coordinator: Owner.
B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for vehicular access, traffic, and parking facilities.
C. During construction, coordinate use of site and facilities through the Project Coordinator.
D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
G. Make the following types of submittals to Architect through the Project Coordinator:
   1. Requests for interpretation.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Manufacturer's instructions and field reports.
   6. Applications for payment and change order requests.
   7. Progress schedules.
   8. Coordination drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION
3.01 PRECONSTRUCTION MEETING

A. Owner will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   3. Contractor.

C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract, ________ and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 SITE MOBILIZATION MEETING

A. Architect will schedule a meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's Superintendent.
   5. Major Subcontractors.

C. Agenda:
   1. Use of premises by Owner and Contractor.
   2. Owner's requirements and occupancy prior to completion.
   3. Construction facilities and controls provided by Owner.
   4. Temporary utilities provided by Owner.
   5. Survey and building layout.
   7. Schedules.
   8. Application for payment procedures.
   9. Procedures for testing.
   11. Requirements for start-up of equipment.
   12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum bi-monthly intervals.

B. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.
C. Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Maintenance of progress schedule.
   7. Corrective measures to regain projected schedules.
   8. Planned progress during succeeding work period.
  10. Effect of proposed changes on progress schedule and coordination.
  11. Other business relating to Work.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE

A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

C. Within 10 days after joint review, submit complete schedule.

D. Submit updated schedule with each Application for Payment.

3.05 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
   1. Delivery Medium: Via email.
   2. File Naming: Include project identification, date and time of view, and view identification.
   3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
   4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.06 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - CLOSEOUT SUBMITTALS.
3.07 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.08 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   5. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

3.09 NUMBER OF COPIES OF SUBMITTALS

A. Documents for Review:
   1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches (215 x 280 mm): Submit the number of copies that Contractor requires, plus two copies that will be retained by Architect.

B. Documents for Information: Submit two copies.

C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.10 SUBMITTAL PROCEDURES

A. Transmit each submittal with approved form.

B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

E. Schedule submittals to expedite the Project, and coordinate submission of related items.

F. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

G. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

H. Provide space for Contractor and Architect review stamps.

I. When revised for resubmission, identify all changes made since previous submission.
J. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

K. Submittals not requested will not be recognized or processed.

END OF SECTION
SECTION 01 3216

CONSTRUCTION PROGRESS SCHEDULE

PART 1  GENERAL

1.01  SECTION INCLUDES
   A. Preliminary schedule.
   B. Construction progress schedule, bar chart type.

1.02  RELATED SECTIONS
   A. Section 01 1000 - Summary: Work sequence.

1.03  REFERENCES
   A. AGC (CPM) - Construction Planning and Scheduling Manual; Associated General Contractors of America; 2004.

1.04  SUBMITTALS
   A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
   B. Submit under transmittal letter form specified in Section 01 3000.

1.05  SCHEDULE FORMAT
   A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
   B. Diagram Sheet Size: Maximum 22 x 17 inches (560 x 432 mm) or width required.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION

3.01  PRELIMINARY SCHEDULE
   A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02  CONTENT
   A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
   B. Identify each item by specification section number.
   C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
   D. Provide legend for symbols and abbreviations used.

3.03  BAR CHARTS
   A. Include a separate bar for each major portion of Work or operation.
   B. Identify the first work day of each week.

END OF SECTION
PART 1  GENERAL

1.01  SECTION INCLUDES

A. References and standards.
B. Quality assurance submittals.
C. Control of installation.
D. Testing and inspection services.
E. Manufacturers' field services.

1.02  RELATED REQUIREMENTS

1.03  REFERENCE STANDARDS


1.04  SUBMITTALS

A. Testing Agency Qualifications:
   1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

1.05  REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
C. Obtain copies of standards where required by product specification sections.
D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06  TESTING AND INSPECTION AGENCIES

A. Owner will employ services of an independent testing agency to perform certain specified testing; payment for cost of services will be derived from allowance specified in Section 01 2100; see Section 01 2100 and applicable sections for description of services included in allowance.
B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
PART 3 EXECUTION

2.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers’ instructions, including each step in sequence.

C. Should manufacturers’ instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

2.02 TESTING AND INSPECTION

A. Testing Agency Duties:
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers’ facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner’s agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

2.03 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and ______ as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

2.04 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION
SECTION 01 4533

CODE-REQUIRED SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Code-required special inspections.
B. Submittals.

1.02 DEFINITIONS


B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.

C. Special Inspection:
   1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved contract documents and the referenced standards.
   2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

1.03 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2008.
E. AWS D1.3 - Structural Welding Code - Sheet Steel; 2008.

1.04 SUBMITTALS

A. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency shall:
   1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
   3. Submit certification that Special Inspection Agency is acceptable to AHJ.

B. Testing Agency Qualifications: Prior to the start of work, the Testing Agency shall:
   1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Submit certification that Testing Agency is acceptable to AHJ.

1.05 SPECIAL INSPECTION AGENCY

A. Owner or Architect will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling required by the building code.

B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.06 TESTING AND INSPECTION AGENCIES

A. Owner or Architect may employ services of an independent testing agency to perform additional testing and sampling associated with special inspections but not required by the building code.

B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

PART 3 EXECUTION

2.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
   1. Continuous Special Inspection: Special Inspection Agency shall be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspection: Special Inspection Agency shall be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

2.02 SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION

A. High-Strength Bolt, Nut and Washer Material:
   1. Verify identification markings conform to ASTM standards specified in the approved contract and to AISC 360, A3.3; periodic.
   2. Submit manufacturer's certificates of compliance; periodic.

B. Weld Filler Material:
   1. Verify identification markings conform to AWS standards specified in the approved contract documents and to AISC 360, A3.5; periodic.
   2. Submit manufacturer's certificates of compliance; periodic.

C. Welding:
   1. Structural steel and cold formed steel deck:
      a. Complete and partial joint penetration groove welds: Verify compliance with AWS D1.1; continuous.
      b. Multipass fillet welds: Verify compliance with AWS D1.1; continuous.
      c. Single pass fillet welds less than 5/16 inch (7.94 mm) wide: Verify compliance with AWS D1.1; continuous.
      d. Plug and slot welds: Verify compliance with AWS D1.1; continuous.
      e. Single pass fillet welds 5/16 inch (7.94 mm) or greater: Verify compliance with AWS D1.1; periodic.
      f. Floor and roof deck welds: Verify compliance with AWS D1.3; continuous.
   2. Reinforcing Steel: Verify items listed below comply with AWS D1.4 and ACI 318, Section 3.5.2.
      a. Verification of weldability; periodic.
      b. Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames as well as boundary elements of special structural walls of concrete and shear reinforcement; continuous.
c. Shear reinforcement; continuous.
d. Other reinforcing steel; periodic.

### 2.03 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION

A. Reinforcing Steel, Including Prestressing of Tendons and Placement: Verify compliance with approved contract documents and ACI 318, 3.5 and 7.1 through 7.7; periodic.

B. Reinforcing Steel Welding: Verify compliance with AWS D1.4 and ACI 318, 3.5.2; periodic.

C. Design Mix: Verify plastic concrete complies with the design mix in approved contract documents and with ACI 318, Chapter 4 and 5.2; periodic.

D. Specified Curing Temperature and Techniques: Verify compliance with approved contract documents and ACI 318, 5.11 through 5.13; periodic.

E. Concrete Strength in Situ: Verify concrete strength complies with approved contract documents and ACI 318, 6.2, for the following.

F. Formwork Shape, Location and Dimensions: Verify compliance with approved contract documents and ACI 318, 6.1.1; periodic.

### 2.04 SPECIAL INSPECTIONS FOR MASONRY CONSTRUCTION

A. Masonry Structures Subject to Special Inspection:
   1. Empirically designed masonry, glass unit masonry and masonry veneer in structures designated as "essential facilities".
   2. Engineered masonry in structures classified as "low hazard..." and "substantial hazard to human life in the event of failure".

END OF SECTION
SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1  GENERAL

1.01  SECTION INCLUDES
   A. Temporary utilities.
   B. Temporary telecommunications services.
   C. Temporary sanitary facilities.
   D. Temporary Controls: Barriers, enclosures, and fencing.
   E. Vehicular access and parking.
   F. Waste removal facilities and services.

1.02  RELATED REQUIREMENTS
   A. Section 01 5100 - Temporary Utilities.
   B. Section 01 5500 - Vehicular Access and Parking.

1.03  TEMPORARY UTILITIES - See Section 01 5100
   A. Owner will provide the following:
      1. Electrical power and metering, consisting of connection to existing facilities.
      2. Water supply, consisting of connection to existing facilities.
   B. New permanent facilities may be used.

1.04  TELECOMMUNICATIONS SERVICES
   A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
   B. Telecommunications services shall include:

1.05  TEMPORARY SANITARY FACILITIES
   A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
   B. Maintain daily in clean and sanitary condition.

1.06  BARRIERS
   A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
   B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
   C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07  FENCING
   A. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.08  VEHICULAR ACCESS AND PARKING - See Section 01 5500
A. Coordinate access and haul routes with governing authorities and Owner.
B. Provide and maintain access to fire hydrants, free of obstructions.
C. Provide means of removing mud from vehicle wheels before entering streets.
D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.09 WASTE REMOVAL
A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
B. Provide containers with lids. Remove trash from site periodically.
C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

PART 2 PRODUCTS - NOT USED
PART 3 EXECUTION - NOT USED

END OF SECTION
SECTION 01 5100
TEMPORARY UTILITIES

PART 1  GENERAL

1.01  SECTION INCLUDES
   A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.02  TEMPORARY ELECTRICITY
   A. Cost: By Owner.
   B. Provide main service disconnect and over-current protection at convenient location and meter.
   C. Permanent convenience receptacles may be utilized during construction.
   D. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.03  TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES
   A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft (21 watt/sq m).
   B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtailed, and lamps as required.
   C. Maintain lighting and provide routine repairs.

1.04  TEMPORARY HEATING
   A. Cost of Energy: By Contractor.
   B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
   C. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.

PART 2  PRODUCTS - NOT USED
PART 3  EXECUTION - NOT USED

END OF SECTION
SECTION 01 5213
FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Temporary field offices for use of Contractor.
B. Maintenance and removal.

1.02 RELATED REQUIREMENTS
A. Section 01 5000 - Temporary Facilities and Controls:
B. Section 01 5500 - Vehicular Access and Parking: Parking and access to field offices.

1.03 USE OF EXISTING FACILITIES
A. Structural
B. Designated existing spaces may be used for field offices: north of the existing automotive building.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

2.02 CONSTRUCTION
A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.

2.03 Contractor OFFICE AND FACILITIES
A. Size: For Contractor's needs and to provide space for project meetings.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.

3.02 REMOVAL
A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION
SECTION 01 5500

VEHICULAR ACCESS AND PARKING

PART 1  GENERAL

1.01  SECTION INCLUDES

A. Access roads.
B. Parking.
C.Existing pavements and parking areas.
D. Flag persons.

PART 2  PRODUCTS

2.01  SIGNS, SIGNALS, AND DEVICES

A. Flag Person Equipment: As required by local jurisdictions.

PART 3  EXECUTION

3.01  ACCESS ROADS

A. Use of designated existing on-site streets and driveways for construction traffic is permitted.
B. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.
C. Provide unimpeded access for emergency vehicles. Maintain 20 foot (6 m) width driveways with turning space between and around combustible materials.
D. Provide and maintain access to fire hydrants free of obstructions.

3.02  PARKING

A. Use of designated areas of existing parking facilities by construction personnel is permitted.

3.03  CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.
B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.

3.04  FLAG PERSONS

A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.05  MAINTENANCE

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, Products, mud, snow, and ice.
B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

END OF SECTION
SECTION 01 5721

INDOOR AIR QUALITY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

1.02 PROJECT GOALS

A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
   1. Cleaning of ductwork is not contemplated under this Contract.
   2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.

B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
   1. Furnish products meeting the specifications.
   2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

C. Ventilation: HVAC system has been designed to achieve the minimum requirements for ventilation specified in ASHRAE 62.1.

1.03 REFERENCE STANDARDS


1.04 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

PART 3 EXECUTION

2.01 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:
   1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
   2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
   3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. Do not store construction materials or waste in mechanical or electrical rooms.

D. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
   1. Inspect duct intakes, return air grilles, and terminal units for dust.
   2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes...
and conduit.

3. Clean tops of doors and frames.

4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.

5. Clean return plenums of air handling units.

6. Remove intake filters last, after cleaning is complete.

E. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

F. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

END OF SECTION
SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1  GENERAL

1.01  SECTION INCLUDES

A. Transportation, handling, storage and protection.
B. Product option requirements.
C. Substitution limitations and procedures.
D. Procedures for Owner-supplied products.

1.02  RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

1.03  SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2  PRODUCTS

2.01  NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.
B. Do not use products having any of the following characteristics:
   1. Made outside the United States, its territories, Canada, or Mexico.
   2. Made using or containing CFC's or HCFC's.
C. Where all other criteria are met, Contractor shall give preference to products that:
   1. Have longer documented life span under normal use.

2.02  PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

PART 3  EXECUTION

3.01  SUBSTITUTION PROCEDURES
A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Will provide the same warranty for the substitution as for the specified product.
   3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

D. Substitution Submittal Procedure:
   1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
   2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   3. The Architect will notify Contractor in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

B. Transport and handle products in accordance with manufacturer's instructions.

C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to
installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers’ instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Prevent contact with material that may cause corrosion, discoloration, or staining.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION
SECTION 01 6116

VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. VOC restrictions for product categories listed below under "DEFINITIONS."

B. All products of each category that are installed in the project must comply; Owner's project goals do not allow for partial compliance.

1.02 RELATED REQUIREMENTS

A. Section 01 6000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site in the building interior:
   1. Adhesives, sealants, and sealer coatings.
   2. Paints and coatings.
   3. Insulation.

B. Interior of Building: Anywhere inside the exterior weather barrier.

C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.04 REFERENCE STANDARDS

A. CAL (CHPS LEM) - Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net/.


C. GEI (SCH) - GREENGUARD "Children and Schools" Certified Products; GREENGUARD Environmental Institute; current listings at www.greenguard.org.

D. GreenSeal GS-03 - Anti-Corrosive Paints; Green Seal, Inc.; 2007

E. GreenSeal GS-36 - Commercial Adhesives; Green Seal, Inc.; 2000.


G. SCS (CPD) - SCS Certified Products; Scientific Certification Systems; current listings at www.scscertified.com.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Evidence of Compliance: Submit for each different product in each applicable category.

C. Product Data: For each VOC-restricted product used in the project, submit product data showing compliance, except when another type of evidence of compliance is required.
D. Installer Certifications for Accessory Materials: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of his products, or 2) that such products used comply with these requirements.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. All VOC-Restricted Products: Provide products having VOC content of types and volume not greater than those specified in State of California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers.

1. Evidence of Compliance: Acceptable types of evidence are:
   d. Current certification by any other agencies acceptable to CHPS.
   e. Report of laboratory testing performed in accordance with CHPS requirements for getting a product listed in the Low-Emitting Materials Product List; report must include laboratory's statement that the product meets the specified criteria.

2. Product data submittals showing VOC content are NOT acceptable forms of evidence.

B. Adhesives and Joint Sealants: Provide only products having volatile organic compound (VOC) content not greater than required by South Coast Air Quality Management District Rule No.1168.

1. Evidence of Compliance: Acceptable types of evidence are:
   a. Report of laboratory testing performed in accordance with requirements.

C. Aerosol Adhesives: Provide only products having volatile organic compound (VOC) content not greater than required by GreenSeal GS-36.

1. Evidence of Compliance: Acceptable types of evidence are:
   a. Current GreenSeal Certification.

D. Paints and Coatings: Provide products having VOC content as specified in Section 09 9000.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. All additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION
SECTION 01 7000

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1  GENERAL

1.01  SECTION INCLUDES

A. Examination, preparation, and general installation procedures.
B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
C. Cutting and patching.
D. Surveying for laying out the work.
E. Cleaning and protection.
F. Closeout procedures, except payment procedures.
G. General requirements for maintenance service.

1.02  RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
B. Section 01 3000 - Administrative Requirements: Submittals procedures.
C. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.
D. Section 02 4100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

1.03  REFERENCE STANDARDS

1.04  SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.
C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   5. Work of Owner or separate Contractor.

1.05  QUALIFICATIONS

A. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor’s Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.06  PROJECT CONDITIONS
A. Use of explosives is not permitted.
B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

1.07 COORDINATION
A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
B. Notify affected utility companies and comply with their requirements.
C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
F. Coordinate completion and clean-up of work of separate sections.
G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS
2.01 PATCHING MATERIALS
A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations; and ________.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations, and ________.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

D. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

G. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
H. Clean existing systems and equipment.
I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
J. Do not begin new construction in alterations areas before demolition is complete.
K. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING
A. Whenever possible, execute the work by methods that avoid cutting or patching.
B. See Alterations article above for additional requirements.
C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-conforming work.
D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
G. Restore work with new products in accordance with requirements of Contract Documents.
H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING
A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning
to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.09 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.10 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.11 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect.

B. Notify Architect when work is considered ready for Substantial Completion.

C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.

D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
E. Notify Architect when work is considered finally complete.
F. Complete items of work determined by Architect's final inspection.

3.12 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION
SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood: May be used as blocking or furring.
   5. Land clearing debris, including brush, branches, logs, and stumps: See Section 31 1000 for use options.
   6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.

E. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

F. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

G. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

E. Section 31 1000 - Site Clearing: Handling and disposal of land clearing debris.
1.03 Definitions

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 Submittals

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted
from landfills will be protected from contamination and prepared for acceptance by
designated facilities; include separation procedures for recyclables, storage, and packaging.

6. Transportation: Identify the destination and means of transportation of materials to be
recycled; i.e. whether materials will be site-separated and self-hauled to designated
centers, or whether mixed materials will be collected by a waste hauler.

C. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and
waste, means of disposal or reuse, and costs; show both totals to date and since last report.
1. Submit updated Report with each Application for Progress Payment; failure to submit
Report will delay payment.
2. Submit Report on a form acceptable to Owner.
3. Landfill Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project
disposed of in landfills.
   c. State the identity of landfills, total amount of tipping fees paid to landfill, and total
   disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and
cost.
4. Incinerator Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project
delivered to incinerators.
   c. State the identity of incinerators, total amount of fees paid to incinerator, and total
   disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and
cost.
5. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and
   receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or
   savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and
cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by
   incineration.
6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards (cubic meters).
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as
appropriate to disposal method.

PART 3  EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES
A. See Section 01 3000 for additional requirements for project meetings, reports, submittal
   procedures, and project documentation.
B. See Section 01 5000 for additional requirements related to trash/waste collection and removal
   facilities and services.
C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and
   handling.
D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION
SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL
A. Project Record Documents.
B. Warranties and bonds.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

END OF SECTION
1.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permit.
   6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

1.02 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. See Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture.

C. Shop Drawings: For steel reinforcement, material test reports and certificates.

1.3 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. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

   1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. 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. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.


E. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from galvanized steel wire into flat sheets.

F. 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 CRSTI’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/II. Supplement with the following:
   a. Fly Ash: ASTM C 618, Class F.

B. Normal-Weight Aggregates: ASTM C 33, graded, 3/4-inch (19-mm) nominal maximum coarse-aggregate size.

1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.


E. 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.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
F. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

2.4 VAPOR RETARDERS
A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.5 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. (305 g/sq. m) 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.
F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.6 RELATED MATERIALS

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. Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength:
a. Elevated slabs - 4000 psi (27.6 MPa) at 28 days.
b. Exterior slabs-on-grade - 4000 psi (27.6 MPa) at 28 days.
c. Interior slabs-on-grade - 3500 psi (24.1 MPa) at 28 days
d. Walls, Piers and Footings - 3000 psi (20.7 MPa)] at 28 days.

2. Maximum Water-Cementitious Materials Ratio:
   a. Exterior 4000 psi concrete - 0.45
   b. Interior 4,000 psi concrete – 0.50
   c. 3500 psi concrete – 0.50
   d. 3000 psi concrete – 0.55

3. Slump Limit:
   a. 4 inches (100 mm) plus or minus 1 inch for concrete with no admixtures.
   b. 8 inches (200 mm) plus or minus 1 inch 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.

5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

6. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended
   rate, but not less than 1.0 lb/cu. yd. (0.60 kg/cu. m).

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 ASTM C 1116, and furnish batch ticket information.
   
      1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and
         delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32
         deg C), 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. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. 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 (3.2 mm). 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 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. 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. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish and to be covered with a coating or covering material applied directly to concrete

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. 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. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in 1 direction.
   1. Apply scratch finish to surfaces indicated and to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. 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 surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. 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 surfaces indicated, exposed to view, to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- (3.05-m-) long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/4 inch (6 mm).

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
   1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

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 (1 kg/sq. m 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 (300 mm), 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. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

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 independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
   1. Testing Services: Tests shall be performed according to ACI 301.

END OF SECTION 033000
SECTION 03 3511
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Surface treatments for concrete floors and slabs.

1.02 RELATED REQUIREMENTS
A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 REFERENCE STANDARDS

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordinate the work with concrete floor placement and concrete floor curing.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.07 FIELD CONDITIONS
A. Maintain light level equivalent to a minimum 200 W light source at 8 feet (2.5 m) above the floor surface over each 20 foot (6 m) square area of floor being finished.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS
A. Unless otherwise indicated, all concrete floors are to be finished using liquid densifier/hardener.
B. Liquid Densifier/Hardener:
   1. Use at following locations: entire floor area of addition.
C. High Gloss Clear Sealer:

2.02 DENSIFIERS AND HARDENERS
A. Liquid Densifier/Hardener: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete prior to set.
   1. Composition: Lithium silicate.
   2. Products:

2.03 COATINGS
A. High Gloss Clear Sealer: Transparent, non-yellowing, water-based coating.
PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that floor surfaces are acceptable to receive the work of this section.
   B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL
   A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION
   A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
   B. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

END OF SECTION
SECTION 03 30 53
MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY
   A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.02 STANDARD REFERENCE
   A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans and specifications are to be used in tandem; where one conflicts with the other, the most costly and higher quality requirement will govern.

   B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".
      1. Refer to Section 520 “Portland Cement Concrete”

1.03 SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Other Action Submittal:
      1. Design Mixtures: For each concrete mixture.

1.04 QUALITY ASSURANCE
   A. Ready-Mix-Concrete 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.

   B. Comply with ACI 301.

   C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 - PRODUCTS

2.01 FORMWORK
   A. Furnish formwork and formwork accessories according to ACI 301.
2.02 STEEL REINFORCEMENT

A. Recycled Content: Provide steel reinforcement with an average recycled content of steel products so that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.


2.03 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 II:
   a. Fly Ash: ASTM C 618, Class C or F.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 120.


B. Normal-Weight Aggregate: ASTM C 33, graded, 3/4-inch (19-mm) nominal maximum aggregate size.


2.04 ADMIXTURES


B. 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, Type A.

2. Retarding Admixture: ASTM C 494, Type C.

3. Water-Reducing and Retarding Admixture: AASHTO M194, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: AASHTO M 194, Type F or G.

6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
2.05 RELATED MATERIALS
   A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.06 CURING MATERIALS
   A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
   B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or burlap cloth with holes.
   C. Moisture-Retaining Cover: ASTM C 171, waterproof paper, polyethylene film or white burlap-polyethylene sheet.
   D. Water: Potable.
   E. Clear, Waterborne, Membrane-Forming Curing Compound: AASHTO M 148, Type ID, Class B or Type 2, Class B.

2.07 CONCRETE MIXTURES
   A. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301 as follows:
      1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
      2. Maximum Water-Cementitious Materials Ratio: 0.45.
      3. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
      4. Slump Limit: AASHTO T 119
      5. Air Content: Maintain within range permitted by ACI 301.

2.08 CONCRETE MIXING
   A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
      1. When air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION
   A. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
   B. Remove loose material from compacted subbase surface immediately before placing concrete.
3.02 EDGE FORMS AND SCREED CONSTRUCTION

A. Design, construct, erect, brace, and maintain formwork according to ACI 301

B. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

C. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage

3.03 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.04 STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.05 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, placing, and consolidating concrete.
C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed paving surface with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.07 FINISHING FORMED/UNFORMED SURFACES

A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
   1. Do not further disturb surfaces before starting finishing operations.

C. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
   1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.08 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 with ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m 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. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

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 (300 mm), 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. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

4. Curing and Sealing Compound: Apply uniformly to slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.09 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests: Perform according to ACI 301.

1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m) but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

2. Testing Frequency: One composite sample shall be obtained for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.

### 3.010 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 1/2 inch (12 mm).

2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).

3. Surface: Gap below 10-foot- (3-m-) long, unveled straightedge not to exceed 1/2 inch (13 mm).

4. Joint Spacing: 1 inches (50 mm).

5. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.

6. Joint Width: Plus 1/8 inch (3 mm), no minus.
3.011 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION
SECTION 051200
STRUCTURAL STEEL FRAMING

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. Structural steel.
   2. Grout.
B. Related Sections:
   1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
   2. Division 05 Section "Steel Decking"
   3. Division 05 Section. “Steel Joist Framing”
   4. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other metal items not defined as structural steel.
   5. Division 05 Section "Metal Stairs."
   6. Division 09 painting Sections and Division 09 Section "High-Performance Coatings" for surface-preparation and priming requirements.

1.3 DEFINITIONS
A. Structural Steel:  Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 PERFORMANCE REQUIREMENTS
A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering design by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
   1. Select and complete connections using schematic details indicated and AISC 360.
   2. Use ASD; data are given at service-load level.
B. Moment Connections: Type FR, fully restrained.

C. Construction: Moment frame.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
   5. For structural-steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
   1. Power source (constant current or constant voltage).

D. Qualification Data: For qualified Installer and fabricator.

E. Welding certificates.

F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

G. Mill test reports for structural steel, including chemical and physical properties.

H. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength bolt-nut-washer assemblies.
   4. Shear stud connectors.
   5. Shop primers.

I. Source quality-control reports.
1.6 QUALITY ASSURANCE

A. Fabricator Qualifications:  A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications:  A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications:  Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303.
   2. AISC 360.
   3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Preinstallation Conference:  Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.  Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.  Protect steel members and packaged materials from corrosion and deterioration.
   
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.  Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and relubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them.  Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work.  Provide setting diagrams, sheet metal templates, instructions, and directions for installation.
PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. W-Shapes: ASTM A 992/A 992M.

C. Channels and Angles-Shapes: ASTM A 36/A 36M.

D. Plate and Bar: ASTM A 36/A 36M.

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
   1. Weight Class: As indicated on plans.
   2. Finish: Black except where indicated to be galvanized.

G. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

H. Steel Forgings: ASTM A 668/A 668M.

I. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
   1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.

B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH (ASTM A 563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers.
   1. Finish: Hot-dip or mechanically deposited zinc coating.
   2. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with mechanically deposited zinc coating, baked epoxy-coated finish.
C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain.

D. Unheaded Anchor Rods: ASTM F 1554, Grade 36

5. Finish: Plain.

E. Headed Anchor Rods: ASTM F 1554, Grade 36 or Grade 105, straight.

3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.

F. Threaded Rods: ASTM A 36/A 36M.

2. Washers: [ASTM F 436 (ASTM F 436M), Type 1, hardened.
3. Finish: Plain.

G. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

H. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.


J. Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Amscot Structural Products Corp.
   b. Fluorocarbon Company Limited.
   c. R.J. Watson Bridge & Structural Engineered Systems.
   d. Seismic Energy Products, L.P.
2. Mating Surfaces: PTFE and PTFE.
3. Coefficient of Friction: Not more than 0.03.
4. Design Load: Not less than 2,000 psi (13.7 MPa).
2.3 PRIMER

A. Primer: SSPC-Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.4 GROUT

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

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

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
   2. Surfaces to be field welded.
   3. Surfaces to be high-strength bolted with slip-critical connections.
   4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
   5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."
   3. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
   4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
   5. SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."
   6. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   7. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
   8. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
   9. SSPC-SP 8, "Pickling."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
4. Radiographic Inspection: ASTM E 94.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.


1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Pretension anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC’s "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
   a. Liquid Penetrant Inspection: ASTM E 165.
   b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
   c. Ultrasonic Inspection: ASTM E 164.
   d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 051200
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:
   2. KCS-type K-series steel joists.
   4. Long Span steel joists.
   5. Joist girders.

B. Related Sections include the following:
   1. Division 03 Section "Cast-in-Place Concrete" for installing bearing plates in concrete.
   2. Division 04 Section "Unit Masonry" for installing bearing plates in unit masonry.

1.3 DEFINITIONS
A. SJI "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 PERFORMANCE REQUIREMENTS
A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

B. Design special joists to withstand design loads with live load deflections no greater than the following:
   1. Floor Joists: Vertical deflection of 1/360 of the span.
   2. Roof Joists: Vertical deflection of 1/360 of the span.
1.5 SUBMITTALS

A. Product Data: For each type of joist, accessory, and product indicated.

B. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.
   1. Indicate locations and details of bearing plates to be embedded in other construction.
   2. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

C. Welding certificates.

D. Manufacturer Certificates: Signed by manufacturers certifying that joists comply with requirements.

E. Mill Certificates: Signed by bolt manufacturers certifying that bolts comply with requirements.

F. Qualification Data: For manufacturer

G. Field quality-control test and inspection reports.

H. Research/Evaluation Reports: For joists.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI "Specifications."
   1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. SJI Specifications: Comply with standard specifications in SJI's "Specifications" that are applicable to types of joists indicated.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

A. Deliver steel bearing plates to be built into cast-in-place concrete.
PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with SJI's "Specifications" for web and steel-angle chord members.
   1. Recycled Content: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Bearing Plates: ASTM A 36/A 36M.

C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
   1. Finish: Plain, uncoated.

D. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
   1. Finish: Plain.

E. Welding Electrodes: Comply with AWS standards.

F. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.2 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.3 K-SERIES STEEL JOISTS


B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

D. Provide holes in chord members for connecting and securing other construction to joists.
E. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

F. Camber joists according to SJI's "Specifications."

G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.4 LONG-SPAN STEEL JOISTS

A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements [as follows:][as indicated.]

2. End Arrangement: Underslung.
3. Top-Chord Arrangement: Parallel

B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Camber long-span steel joists according to SJI's "Specifications."

E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.5 JOIST GIRDERS

A. Manufacture joist girders according to "Standard Specifications for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as follows:

1. End Arrangement: Underslung with bottom-chord extensions.
2. Top-Chord Arrangement: Parallel.

B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

C. Provide holes in chord members for connecting and securing other construction to joist girders.

D. Camber joist girders according to SJI's "Specifications."

E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).
2.6 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated.

C. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface, unless otherwise indicated.

D. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.7 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Apply 1 coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.
C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.


E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

B. In addition to visual inspection, field welds will be tested according to AWS D1.1/D1.1M and the following procedures, as applicable:

4. Liquid Penetrant Inspection: ASTM E 165.

C. Bolted connections will be visually inspected.

D. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."

E. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

F. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, [abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100
SECTION 053100
STEEL DECKING

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. Roof deck.
   2. Non-composite form deck.

B. Related Sections include the following:
   1. Division 03 Section "Cast-in-Place Concrete" for concrete fill.
   2. Division 05 Section "Structural Steel Framing" for shop- and field-welded shear connectors.
   3. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
   4. Division 09 painting Sections for repair painting of primed deck.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: For each type of steel deck, signed by product manufacturer.

D. Welding certificates.

E. Field quality-control test and inspection reports.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   1. Power-actuated mechanical fasteners.

G. Research/Evaluation Reports: For steel deck.
1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

D. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Deck:
   a. ASC Profiles, Inc.
   c. Consolidated Systems, Inc.
   d. DACS, Inc.
   e. D-Mac Industries Inc.
   f. Epic Metals Corporation.
   g. Marilyn Steel Decks, Inc.
   h. New Millennium Building Systems, LLC.
   i. Nucor Corp.; Vulcraft Division.
   j. Roof Deck, Inc.
   k. United Steel Deck, Inc.
   l. Valley Joist; Division of EBSCO Industries, Inc.
   m. Verco Manufacturing Co.
   n. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.
2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 (230) minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
2. Deck Profile: Type WR, wide rib.
3. Profile Depth: 1-1/2 inches (38 mm).
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: Triple span or more.

2.3 NONCOMPOSITE FORM DECK

A. Noncomposite Steel Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
2. Profile Depth: 9/16 inch (14 mm).
3. Design Uncoated-Steel Thickness: 0.0179 inch (0.45 mm).
4. Span Condition: Triple span or more.
5. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch (1.90 mm) thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.

I. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and level recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.

J. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:

1. **Weld Diameter:** 5/8 inch (16 mm) nominal.
2. **Weld Spacing:** Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches (305 mm) apart in the field of roof and 6 inches (150 mm) apart in roof corners and perimeter.
3. **Weld Washers:** Install weld washers at each weld location, if deck thickness is less than 0.028 inch.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches (450 mm), and as follows:

1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. **End Joints:** Lapped 2 inches (51 mm) minimum

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches (305 mm) apart with at least one fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten] to substrate to provide a complete deck installation.

1. **Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.**

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in in Division 07 Section
3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch (16 mm)
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches (910 mm), and as follows:

1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. End Joints: Lapped or butted at Contractor's option.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.
3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
   1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100
METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with grating treads.
B. Structural steel stair framing and supports.
C. Handrails and guards.

1.02 REFERENCE STANDARDS

E. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.
F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.

1.03 SUBMITTALS

A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
   2. Dimensions: As indicated on drawings.
   3. Shop assemble components; disassemble into largest practical sections suitable for
transport and access to site.
4. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
5. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
1. Industrial: All joints made neatly.
   a. Welded Joints: Welded on back side wherever possible.
   b. Welds Exposed to Touch: Ground smooth.
   c. Bolts Exposed to Touch in Travel Area: No nuts or screw threads exposed to touch.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with
design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except
where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH GRATING TREADS

A. Jointing and Finish Quality Level: Industrial, as defined above.

B. Risers: Open ships ladder type.

C. Treads: Steel bar grating.
   1. Grating Type: Welded.
   2. Bearing Bar Depth: 3/4 inch (19 mm), minimum.
   3. Top Surface: Standard.
   6. Anchorage to Stringers: End plates welded to grating, bolted to stringers.

D. Stringers: Rolled steel channels.
   1. Stringer Depth: 10 inches (250 mm).
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

E. Railings: Steel pipe railings.

F. Finish: Shop- or factory-prime painted.

2.03 HANDRAILS AND GUARDS

A. Guards:
   1. Top Rails: Round pipe or tube rails unless otherwise indicated.
      a. Outside Diameter: 1-1/4 inch (31 mm), minimum, to 1-1/2 inches (38 mm), maximum.
   2. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
      a. Outside Diameter: 1 inch (25 mm).
      b. Material: Steel pipe or tube, round.
      c. Vertical Spacing: Maximum 4 inches (100 mm) on center.
      d. Jointing: Welded and ground smooth and flush.
   3. End and Intermediate Posts: Same material and size as top rails.
      a. Horizontal Spacing: As indicated on drawings.
      b. Mounting: Welded to top surface of stringer.

2.04 MATERIALS

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A500 or ASTM A501 structural tubing, round and shapes as indicated.

C. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

D. Steel Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, and galvanized to ASTM
A153/A153M where connecting galvanized components.

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

2.05 SHOP FINISHING

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

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

3.03 INSTALLATION

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

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

C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1.

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

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

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

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION
SECTION 055213

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Steel pipe and tube railings.

1.2 PERFORMANCE REQUIREMENTS
A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
B. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
      b. Infill load and other loads need not be assumed to act concurrently.
C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 SUBMITTALS
A. Product Data: For the following:
   1. Manufacturer's product lines of mechanically connected railings.
   2. Railing brackets.
B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
C. Samples: For each type of exposed finish required.
D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, Work include, but are not limited to, the following:

   1. Steel Pipe and Tube Railings:
      a. Pisor Industries, Inc.
      b. Wagner, R & B, Inc.; a division of the Wagner Companies.

2.2 METALS, GENERAL

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL AND IRON

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Tubing: ASTM A 500 (cold formed) or] ASTM A 513.

C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners: Provide the following:

   1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 for zinc coating.
2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.

B. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

D. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

G. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

H. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.

I. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.

J. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.


2.5 FABRICATION

A. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

B. Form work true to line and level with accurate angles and surfaces.

C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
D. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

E. Form changes in direction by bending or by inserting prefabricated elbow fittings.

F. Bend members in jigs to produce uniform curvature without buckling or otherwise deforming exposed surfaces.

G. Close exposed ends of railing members with prefabricated end fittings.

H. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

   1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers to transfer loads through wall finishes.

2.6 STEEL AND IRON FINISHES

A. Galvanized Railings:

   1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
   2. Hot-dip galvanize indicated steel and iron railings, including hardware, after fabrication.

B. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

   1. Do not apply primer to galvanized surfaces.


   1. Color: As determined by Owner.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).

3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

B. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Anchor posts in concrete by inserting into formed or core-drilled holes and grouting annular space.

D. Anchor posts to metal surfaces with oval flanges.

E. Anchor railing ends at walls with round flanges anchored to wall construction.

F. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.

3.2 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055213
PART 1 GENERAL

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

2.03 CONSTRUCTION PANELS

2.04 FACTORY WOOD TREATMENT

PART 3 EXECUTION

END OF SECTION
SECTION 07 4214
INSULATED METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory-assembled metal panel system for walls, with trim, related flashings and accessory components.

B. Secondary sub-girt framing system, attached to building structural frame.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Structural Steel: Structural steel building frame.

1.03 REFERENCE STANDARDS


1.04 PRE-INSTALLATION MEETING

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on assembled panel structural capabilities.

C. Shop Drawings: Indicate dimensions.

D. Samples: Submit two samples of panel, _____x____ inch (____x____ mm) in size illustrating finish color, sheen, and texture.

E. Design and Performance Data: Indicate panel profile and dimensions.

F. Manufacturer's Installation Instructions: Indicate special handling criteria.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store pre-finished material off ground with weather protection to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion, including:
   1. Degradation of panel finish including color fading caused by exposure to weather.

PART 2 PRODUCTS
2.01 MANUFACTURERS

A. Kingspan-Morin; Product 300 A Azteco Embossed.

B. Other Acceptable Manufacturers:
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEM

A. Metal Panel System: Factory-assembled metal panel system, with trim, related flashings and
   accessory components.
   1. Provide positive drainage to exterior for moisture entering or condensation occurring within
      panel system.
   2. Accommodate tolerances of building structural framing.

B. Performance Requirements:
   1. Thermal Performance: Provide thermal resistance through entire system (R-value) of 25
      deg F hr sq ft/Btu (K sq m/W), minimum.
   2. Structural Performance: Design and size to withstand all dead loads and wind loads
      caused by positive and negative wind pressure acting normal to plane of panel.
      a. Verify structural performance in accordance with ASTM E330, using test pressure 1.5
         times design wind pressure, with 10 seconds duration of maximum load.
   3. Movement: Accommodate the movement caused by the following without damage to
      system, components, or deterioration of seals:
      a. Normal movement between system components.
      b. Seasonal temperature cycling.
      c. Deflection of structural support framing.

2.03 PANELS AND TRIM

A. Wall Panels: Exterior and interior metal sheet skin, factory-assembled, with foamed in place
   insulation; exterior and interior sheet interlocking at edges, fitted with continuous gaskets.
   1. Panel Width: 36 inches (_____ mm).
   2. Exterior Sheet: Stainless steel, minimum 24 gage (0.6 mm) thick; stucco embossed.
   3. Interior Sheet: Stainless steel, minimum 26 gage (0.5 mm) thick; stucco embossed.
   4. Panel Edge Profile: Tongue and groove, for flush seam.
   5. Exterior Finish: Polyvinylidene fluoride (PVDF) coating; ________ color.
   6. Interior Finish: Polyvinylidene fluoride (PVDF) coating; ________ color.

B. Internal and External Corners: Same material, thickness, and finish as exterior sheets;
   factory-fabricated mitered to required angles in one continuous piece with minimum 18 inch (450
   mm) returns.

C. Trim, Closure Pieces, Expansion Joints, Caps, Flashings, Fascias, and Infills: Same material,
   thickness and finish as exterior sheets; factory-fabricated to required profiles; fabricated in
   longest practicable lengths.

2.04 PANEL MATERIALS

A. Precoated Galvanized Steel Sheet: ASTM A653/A653M, Commercial Steel (CS) or Forming
   Steel (FS), with G90/Z275 coating; continuous-coil-coated with acrylic primer coat, silicone
   polyester top coat, and polyester washcoat for panel back.

B. Foamed-in-Place Insulation: Urethane type.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install panel system on walls and soffits in accordance with manufacturer's instructions.

B. Permanently fasten panel system to structural supports; aligned, level, and plumb, within specified tolerances.

C. Locate panel joints over supports.

D. Use concealed fasteners unless otherwise approved by Architect.

E. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.02 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch (1.6 mm).

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch (6 mm).

3.03 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Wood-fiber cement siding.

1.02 RELATED REQUIREMENTS
   A. Section 06 1000 - Rough Carpentry: Siding substrate.
   B. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Manufacturer's data sheets on each product to be used, including:
      1. Manufacturer's requirements for related materials to be installed by others.
      2. Preparation instructions and recommendations.
      3. Storage and handling requirements and recommendations.
      4. Installation methods, including nail patterns.

1.05 QUALITY ASSURANCE
   A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 3 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING
   A. Store products under waterproof cover and elevated above grade, on a flat surface.

PART 2 PRODUCTS

2.01 SIDING
   A. Panel Siding: Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment. The intent is to match the existing panel installation on the adjacent Automotive Building.
      1. Texture: Smooth.
      2. Length (Height): random inches (mm), nominal.
      3. Thickness: 5/16 inch (8 mm), nominal.
      5. Warranty: 50 year limited; transferable.
      6. Panel Siding Manufacturers:

2.02 ACCESSORIES
   A. Plastic Trim: free foam cellular PVC material with small cell microstructure and density of .55 grams /cu cm.
      1. Texture: smooth.
      2. Thickness: 3/4" actual.
3. Finish: Field painted.
5. Products:
   a. Azek traditional trim
   b. Certainteed restoration millwork.

B. Siding Flashing: Z, T, F shaped, 26 gauge mill finish aluminum built into siding at all horizontal transitions unless aluminum reveals are indicated.
   1. Finish: Mill finish not to be field painted.
   2. Vertical Trim: FCP - vertical
   3. Horizontal Trim: FCP - T piece
   4. Corners: FCP - J channel
   5. Products: Frye Reglet Corp fiber cement panel trim.

C. Fasteners: Galvanized or corrosion resistant; length as required to penetrate high hat installation over insulated metal panel, minimum 1-1/4 inch (32 mm).

D. Joint Sealer: As specified in Section 07 9005.

E. Fastener Head Filler: Bond & Fill trim Stick Putty by Bond & Fill LLC or as recommended by panel manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Do not begin until unacceptable conditions have been corrected.

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

3.02 INSTALLATION

A. Cement Fiber Siding Installation:
   1. Install in accordance with manufacturer’s instructions and recommendations.
   2. Read warranty and comply with all terms necessary to maintain warranty coverage.
   3. Use trim details indicated on drawings.
   4. Touch up all field cut edges before installing.
   5. Pre-drill nail holes if necessary to prevent breakage.
   6. Maintain manufacturer’s recommended clearance to grade and roof.
   7. Seal between siding panels and aluminum trim in accordance with trim and siding manufacturers recommendations.

B. Plastic Trim Installation:
   1. Install in accordance with manufacturer’s instructions and recommendations. Allow for thermal expansion and contraction of 1/8” per 18 feet of plastic trim.
   2. Plastic trim shall be cut, drilled, milled, routered and edge finished using the same tools used for lumber.
   3. Install fasteners no more than 2” from the end of the board. Pre-drill holes when recommended by the manufacturer, Install fasteners no further apart than 16” o.c.
   4. Boards shall be secured to flat, solid surfaces, over 1/2” fire retardant plywood.
   5. All plastic trim to plastic trim joints shall be glued in accordance with manufacturers recommendations. For long runs with glued joints, allow for expansion and contraction at the end of the runs.
   6. Install siding flashing continuously at the top edge of the trim.
   7. Fasteners shall be set flush with the surface of the trim.
8. Fit all exposed fastener holes with specified colored putty to match trim surface color.

C. Allow space between both ends of the siding panels that butt against trim for thermal movement, seal joint between panel and trim with exterior grade sealant.


E. Do not install siding less than 6 inches (150 mm) from surface of ground nor closer than 1 inch (25 mm) to roofs, patios, porches, and other surfaces where water may collect.

F. After installation, seal all joints except lap joints of lap siding. Seal around all penetrations. Paint all exposed cut edges.

3.03 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.
SECTION 07 5400
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered system with thermoplastic roofing membrane.
B. Insulation, flat and tapered.
C. Vapor retarder.
D. Flashings.
E. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers and curbs.
B. Section 06 1000 - Rough Carpentry: Wood cant strips.
C. Section 07 6200 - Sheet Metal Flashing and Trim: Counterflashings, reglets.
D. Section 07 7200 - Roof Accessories: Roof-mounted units; prefabricated curbs.
E. Section 08 6200 - Unit Skylights: Skylight frame, integral curb, and counterflashing.
F. Section 22 1006 - Plumbing Piping Specialties: Roof drains.

1.03 REFERENCE STANDARDS


1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
C. Specimen Warranty: For approval.
D. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.
E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner’s name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section:
   1. Approved by membrane manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Store products in weather protected environment, clear of ground and moisture.

C. Protect foam insulation from direct exposure to sunlight.

1.08 WARRANTY

A. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within 5 years after installation.

B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 20 years.
   2. For repair and replacement include costs of both material and labor in warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermoplastic Polyolefin Membrane Materials:

B. Insulation:
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROOFING - UNBALLASTED APPLICATIONS

A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.

B. Roofing Assembly Requirements:
      a. Field applied coating may not be used to achieve specified SRI.
   2. Insulation Thermal Value (R), minimum: 42 (Forty two); provide insulation of thickness required.

C. Acceptable Insulation Types - Constant Thickness Application: Any of the types specified.
   1. Minimum 2 layers of cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.
   2. Bottom layer of cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, composite, or cellular glass board covered with single layer of cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.

D. Acceptable Insulation Types - Tapered Application: Any of the types specified.
1. Tapered perlite or extruded polystyrene board.
2. Tapered perlite, extruded polystyrene, or cellular glass board covered with uniform thickness cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.
3. Uniform thickness cellulose, perlite, composite, polyisocyanurate, extruded polystyrene, molded polystyrene, glass fiber, or cellular glass board covered with tapered extruded polystyrene, or perlite board.

2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Membrane:
   3. Thickness: 0.060 inch (1.5 mm), minimum.
   4. Sheet Width: Factory fabricated into largest sheets possible.
   5. Solar Reflectance: 0.75, minimum, initial, and 0.65, minimum, 3-year, certified by Cool Roof Rating Council.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Vapor Retarder: Material approved by roof manufacturer complying with requirements of fire rating classification; compatible with roofing and insulation materials.
   1. Fire-retardant adhesive.

D. Flexible Flashing Material: Same material as membrane.

E. Separation Sheet: Sheet polyethylene; 4 mil (0.1 mm) thick.

2.04 INSULATION

A. Glass Fiber Board Insulation: Rigid glass fiber, ASTM C726; top surface coated with asphalt and Kraft paper, with the following characteristics:
   1. Board Size: 48 x 48 inch (1220 x 1220 mm).
   2. Board Thickness: 1 inches (25 mm).
   4. Thermal Conductivity (k factor): 0.26 (0.45) as determined by ASTM C177.

2.05 ACCESSORIES

A. Prefabricated Roofing Expansion Joint Flashing: As specified in Section 07 7100.

B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

C. Cant and Edge Strips: Wood fiberboard, compatible with roofing materials; cants formed to 45 degree angle.

D. Pre-Cut Tapered Insulation:
   1. Manufacturers:
      b. Substitutions: See Section 01 6000 - Product Requirements.

E. Sheathing Adhesive: Non-combustible type, for adhering gypsum sheathing to metal deck.

F. Sheathing Joint Tape: Paper type, ____ inch (____ mm) wide, self adhering.

G. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches (150 mm) wide; self adhering.
H. Membrane Adhesive: As recommended by membrane manufacturer.
I. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
J. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
K. Insulation Adhesive: As recommended by insulation manufacturer.
L. Roofing Nails: Galvanized, hot dipped type, size and configuration as required to suit application.
M. Strip Reglet Devices: Galvanized steel, maximum possible lengths per location, with attachment flanges.
N. Insulation Perimeter Restraint: Stainless steel edge device configured to restrain insulation boards in position and provide top flashing over ballast.
O. Sealants: As recommended by membrane manufacturer.
P. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   1. Composition: us rubber with natural surface or concrete pavers.
   2. Surface Color: black or grey.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL
A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
B. Do not apply roofing membrane during unsuitable weather.
C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.02 EXAMINATION
A. Verify that surfaces and site conditions are ready to receive work.
B. Verify deck is supported and secure.
C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
D. Verify deck surfaces are dry and free of snow or ice.
E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.03 METAL DECK PREPARATION
A. Install deck sheathing on metal deck:
   1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
   2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth
surface.
3. Tape joints.
4. Fasten sheathing to roof deck with continuous mopping of adhesive on each flute.

3.04 VAPOR RETARDER AND INSULATION - UNDER MEMBRANE

A. Apply vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
   1. Extend vapor retarder under cant strips and blocking to deck edge.
   2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.

B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

C. Attachment of Insulation: Embed insulation in adhesive in full contact, in accordance with roofing and insulation manufacturers' instructions.

D. Lay subsequent layers of insulation with joints staggered minimum 6 inch (150 mm) from joints of preceding layer.

E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

F. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

G. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

H. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

I. Do not apply more insulation than can be covered with membrane in same day.

3.05 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive to substrate at rate recommended by manufacturer. Fully embed membrane in adhesive except in areas directly over or within 3 inches (75 mm) of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches (75 mm). Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

E. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 4 inches (100 mm) onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to nailing strips.

F. Around roof penetrations, seal flanges and flashings with flexible flashing.

G. Install roofing expansion joints where indicated. Make joints watertight.
   1. Install prefabricated joint components in accordance with manufacturer's instructions.

H. Coordinate installation of roof drains and sumps and related flashings.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field quality control and inspection.

B. Require site attendance of roofing and insulation material manufacturers daily during installation
of the Work.

3.07 CLEANING
   A. Remove bituminous markings from finished surfaces.
   B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
   C. Repair or replace defaced or damaged finishes caused by work of this section.

3.08 PROTECTION
   A. Protect installed roofing and flashings from construction operations.
   B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION
SECTION 07 7100

ROOF SPECIALTIES

PART 1  GENERAL

1.01  SECTION INCLUDES

A. Manufactured roof specialties, including copings, fascias, gravel stops, vents, and snow guards.
B. Roof control and expansion joint covers.

1.02  RELATED REQUIREMENTS

A. Section 07 7200 - Roof Accessories: Manufactured curbs, roof hatches, and snow guards.

1.03  REFERENCE STANDARDS


1.04  SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

1.05  QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual details.

PART 2  PRODUCTS

2.01  MANUFACTURERS

A. Roof Edge Flashings and Copings:
   1. Material: Aluminum or steel custom color to match exterior insulated panel.
   2. Substitutions: See Section 01 6000 - Product Requirements.
B. Control and Expansion Joint Covers:
   3. Substitutions: See Section 01 6000 - Product Requirements.
C. Pipe and Penetration Flashings:
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02  COMPONENTS

A. Roof Edge Flashings: Factory fabricated or custom to sizes required; mitered, welded corners; concealed fasteners to match exterior insulated panel color.
   1. Configuration: Fascia, cant, and edge securement for roof membrane;
   2. Pull-Off Resistance: Tested in accordance with SPRI ES-1 RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable code.
3. Material: Extruded aluminum, 0.08 inch (2.0 mm) thick, minimum.
4. Material: Formed steel sheet, galvanized, 24 gage, 0.024 inch (0.6 mm) thick, minimum.
5. Color: As shown on drawings to match insulated panel color.

B. Copings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
   1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners.
   2. Pull-Off Resistance: Tested in accordance with SPRI ES-1 RE-3 to positive and negative design wind pressure as defined by applicable code.
   3. Material: Formed aluminum sheet, 0.050 inch (1.3 mm) thick, minimum.

C. Control and Expansion Joint Covers: Composite construction 2 inch wide flexible EPDM flashing of white color with closed cell urethane foam backing, each edge seamed to aluminum sheet metal flanges, designed for nominal joint width of 1 inch (25 mm). Include special formed corners, tees, intersections, and wall flashings, each sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions.

END OF SECTION
SECTION 07 7200

ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured curbs, equipment rails, and pedestals.
B. Roof hatches.

1.02 RELATED REQUIREMENTS

A. Section 07 7100 - Roof Specialties: Other manufactured roof items.

1.03 REFERENCE STANDARDS


1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.01 MANUFACTURED CURBS

A. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies:
B. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies:
   Factory-assembled hollow sheet metal construction with fully mitered and welded corners, integral counterflashing, internal reinforcing, and top side and edges formed to shed water.
   1. Sheet Metal: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33 (230); G60 (Z180) coating designation; 18 gage, 0.048 inch (1.21 mm) thick.
   2. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing insulation; 1:1 slope; minimum cant height 4 inches (200 mm).
   3. Manufacture curb bottom and mounting flanges for installation directly on roof deck, not on insulation; match slope and configuration of roof deck.
   4. Provide the layouts and configurations shown on the drawings.
C. Curbs Adjacent to Roof Openings: Provide curb on all sides of opening, with top of curb horizontal for equipment mounting.
   1. Provide preservative treated wood nailers along top of curb.
   2. Insulate inside curbs with 1-1/2 inch (38 mm) thick fiberglass insulation.
3. Height Above Finished Roof Surface: 6 inches (152 mm), minimum.
4. Height Above Roof Deck: 14 inches (356 mm), minimum.

D. Pipe, Duct, and Conduit Mounting Pedestals: Vertical posts, minimum 8 inches (400 mm) square unless otherwise indicated.
   1. Provide sliding channel welded along top edge with adjustable height steel bracket, manufactured to fit item supported.
   2. Height Above Finished Roof Surface: 6 inches (152 mm), minimum.
   3. Height Above Roof Deck: 14 inches (356 mm), minimum.

2.02 ROOF HATCHES

A. Manufacturers - Roof Hatches:
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Roof Hatches: Factory-assembled steel frame and cover, complete with operating and release hardware.
   1. For Ships Ladder Access: Single leaf; 30 by 54 inches (762 by 1372 mm).

C. Frames/Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
   1. Material: Galvanized steel, 14 gage, 0.0747 inch (1.90 mm) thick.
   3. Insulation: 1 inch (25 mm) rigid glass fiber, located on outside face of curb.

D. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
   1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf (475 kPa) load.
   2. Hinges: Heavy duty pintle type.
   3. Hold open arm with vinyl-coated handle for manual release.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

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

3.03 INSTALLATION

A. Install in accordance with manufacturer’s instructions, in manner that maintains roofing weather integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.
3.05 PROTECTION

A. Protect installed products until completion of project.

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

END OF SECTION
SECTION 07 9005

JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Sealants and joint backing.

1.02 RELATED REQUIREMENTS
   A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
   B. Section 07 2500 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders:
   C. Section 08 6300 - Metal-Framed Skylights: Structural and weatherseal sealants and accessories.

1.03 REFERENCE STANDARDS

1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordinate the work with other sections referencing this section.

1.05 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.06 FIELD CONDITIONS
   A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Correct defective work within a five year period after Date of Substantial Completion.
   C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Silicone Sealants:
      5. Substitutions: See Section 01 6000 - Product Requirements.
   B. Polyurethane Sealants:
4. Substitutions: See Section 01 6000 - Product Requirements.

C. Butyl Sealants:
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SEALANTS

A. Sealants and Primers - General: Provide products having volatile organic compound (VOC) content as specified in Section 01 6116.

2.03 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
B. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
C. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.
B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.
B. Clean and prime joints in accordance with manufacturer's instructions.
C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Perform installation in accordance with ASTM C1193.
C. Install bond breaker where joint backing is not used.
D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
F. Tool joints concave.

3.04 CLEANING

A. Clean adjacent soiled surfaces.
3.05 PROTECTION

A. Protect sealants until cured.

END OF SECTION
SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1  GENERAL

1.01  SECTION INCLUDES

A. Non-fire-rated steel doors and frames.
B. Fire-rated steel doors and frames.
C. Thermally insulated steel doors.

1.02  RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.
B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

1.03  REFERENCE STANDARDS

F. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.

1.04  SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

1.05  QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
B. Maintain at the project site a copy of all reference standards dealing with installation.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS AND FRAMES

A. Requirements for All Doors and Frames:
   2. Door Top Closures: Flush with top of faces and edges.
   3. Door Edge Profile: Beveled on both edges.
   5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   6. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   7. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 STEEL DOORS

A. Exterior Doors:
   1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
   2. Core: Polystyrene foam.
   3. Top Closures for Outswinging Doors: Flush with top of faces and edges.
   4. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer’s standard coating thickness.
   5. Texture: Smooth faces.
   6. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C1363.
   7. Weatherstripping: Separate, see Section 08 7100.
   8. Finish: Factory primed, for field finishing.

B. Interior Doors, Non-Fire-Rated:
   1. Grade: ANSI A250.8 Level 1, physical performance Level C, Model 1, full flush.
   2. Thickness: 1-3/4 inches (44 mm).
   3. Texture: Smooth faces.

C. Interior Doors, Fire-Rated:
   1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 1, full flush.
   2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
2.04 STEEL FRAMES

A. General:
   1. Comply with the requirements of grade specified for corresponding door.
      a. ANSI A250.8 Level 3 Doors: 14 gage frames all doors except 12'x14' door.
      b. ANSI A250.8 Level 4 Doors: 12 gage frames at 12'x14' door.
   2. Finish: Same as for door.
   3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
   4. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches (100 mm) high to fill opening without cutting masonry units.

B. Exterior Door Frames: Face welded, seamless with joints filled.
   1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
   2. Weatherstripping: Separate, see Section 08 7100.

C. Interior Door Frames, Fire-Rated: Knock-down type.
   1. Fire Rating: Same as door, labeled.

2.05 ACCESSORY MATERIALS

A. Glazing: As specified in Section 08 8000, factory installed.

B. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

C. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

D. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.06 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. In addition, install fire rated units in accordance with NFPA 80.
C. Coordinate frame anchor placement with wall construction.
D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
E. Coordinate installation of hardware.
F. Coordinate installation of glazing.

3.04 TOLERANCES
A. Maximum Diagonal Distortion: 1/16 in (1.5 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING
A. Adjust for smooth and balanced door movement.

END OF SECTION
SECTION 08 3613
SECTIONAL DOORS

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Overhead sectional doors, manually operated.
B. Operating hardware and supports.
C. Electrical controls.

1.02  RELATED REQUIREMENTS
A. Section 06 1000 - Rough Carpentry: Rough wood framing for door opening.
B. Section 07 9005 - Joint Sealers: Perimeter sealant and backup materials.
C. Section 09 9000 - Painting and Coating: Finish painting.
D. Section 22 0513 - Common Motor Requirements for Plumbing Equipment.

1.03  REFERENCE STANDARDS
C. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2009, Revision 1 - 2010.
D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04  SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Show component construction, anchorage method, and hardware.
C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05  QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06  WARRANTY
A. See Section 01 7800 - Closeout Submittals for warranty requirements.
B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2  PRODUCTS

2.01  MANUFACTURERS
A. Overhead Door Company; Product Thermocore commercial #592 with vision windows Min R value of 17 or equal. www.overheaddoor.com
B. Other Acceptable Manufacturers:
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 STEEL DOOR COMPONENTS

A. Steel Doors: Stile and rail steel with solid and glazed panels; high lift operating style with track and hardware; complying with DASMA 102, Commercial application.
   1. Door Nominal Thickness: 2 inches (50 mm) thick.
   2. Exterior Finish: Pre-finished with baked enamel of white color.
   3. Interior Finish: Pre-finished with baked enamel of white color.
   4. Glazed Lights: two glazed lights per panel, one row; set in place with resilient glazing channel.

B. Door Panels: Stile and rail construction, of steel sheet 0.058 inch (1.5 mm) thick, with welded joints; rabbeted weather joints at meeting rails.

C. Glazing: Type Insulated glass specified in Section 08 8000.

2.03 DOOR COMPONENTS

A. Track: Galvanized steel angles, 0.094 inch (2.4 mm) thick; 2-5/16 x 4 inch (59 x 102 mm) size, continuous one piece per side; galvanized steel mounting brackets 1/4 inch (6 mm) thick.

B. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

C. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.

D. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

E. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

F. Head Weatherstripping: EPDM rubber seal, one piece full length.

G. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

H. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.
   I. Lock Cylinders: Keyed alike.

2.04 ELECTRICAL OPERATION

A. Electrical Characteristics: Overhead Door Destiny #1500 or equal.

B. Motor: Comply with requirements of Section 22 0513.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

D. Disconnect Switch: Factory mount disconnect switch in control panel.

E. Electric Operator: Side mounted on cross head shaft, adjustable safety friction clutch; brake system actuated by independent voltage solenoid controlled by motor starter; enclosed gear driven limit switch; enclosed magnetic cross line reversing starter; mounting brackets and hardware.

F. Safety Edge: At bottom of door panel, full width; electro-mechanical sensitized type, wired to
stop door upon striking object; hollow neoprene covered to provide weatherstrip seal.

G. Control Station: Standard three button (open-close-stop) momentary type control for each electric operator.
1. 24 volt circuit.
2. Surface mounted.
3. Locate at inside door jamb.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

B. Apply primer to wood frame.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.04 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch (1.5 mm).

B. Maximum Variation from Level: 1/16 inch (1.5 mm).

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch (3 mm) from 10 ft (3 m) straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

3.06 CLEANING

A. Clean doors and frames and glazing.

B. Remove temporary labels and visible markings.

3.07 PROTECTION

A. Protect installed products from damage during subsequent construction.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION
SECTION 08 6200
UNIT SKYLIGHTS

PART 1  GENERAL

1.01 SECTION INCLUDES
   A. Preformed plastic skylights with integral metal frame.
   B. Integral insulated curb.

1.02 RELATED REQUIREMENTS
   A. Section 06 1000 - Rough Carpentry: Wood framing for rough opening.
   B. Section 07 7200 - Roof Accessories: Manufactured curbs for installation of unit skylights.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Shop Drawings: Indicate configurations, dimensions, locations, fastening methods, and installation details.

1.05 QUALITY ASSURANCE

1.06 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2  PRODUCTS

2.01 MANUFACTURERS
   A. Unit Skylights:
      2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 UNIT SKYLIGHTS
   A. Unit Skylights: Factory-assembled glazing in aluminum frame, free of visual distortion, weathertight.
      1. Shape: Square dome.
      2. Glazing: Double.
      3. Operation: None; fixed.
      4. Nominal Size: 48x48 inches (____x____ mm).

   B. Performance Requirements:
      1. Allow for expansion and contraction within system components caused by a cycling surface temperature range of 170 degrees F (95 degrees C) without causing detrimental effects to system or components.

2.03 COMPONENTS
   A. Double Glazing: Acrylic plastic with aerogel insulation between layers; factory sealed.
1. Outer Glazing: Clear transparent.
2. Inner Glazing: Clear transparent.

B. Frames: ASTM B221 (ASTM B221M) Extruded aluminum thermally broken, reinforced and welded corner joints, integral curb frame mounting flange and counterflashing to receive roofing flashing system, with integral condensation collection gutter, glazing retainer; clear anodized finish.

2.04 ACCESSORIES
A. Anchorage Devices: Type recommended by manufacturer, exposed to view.
B. Counterflashings: Same metal type and finish as skylight frame.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify existing conditions before starting work.
B. Verify that openings and substrate conditions are ready to receive work of this section.

3.02 INSTALLATION
A. Place skylight units and secure. Install counterflashing as required.
B. Apply sealant to achieve watertight assembly.

3.03 CLEANING
A. Remove protective material from prefinished aluminum surfaces.
B. Wash down exposed surfaces; wipe surfaces clean.
C. Remove excess sealant.

END OF SECTION
SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Hardware for hollow steel doors.
   B. Hardware for fire-rated doors.
   C. Lock cylinders for doors for which hardware is specified in other sections.
   D. Thresholds.
   E. Weatherstripping, seals and door gaskets.

1.02 RELATED REQUIREMENTS
   A. Section 08 1113 - Hollow Metal Doors and Frames.
   B. Section 08 3613 - Sectional Doors: Hardware for same, except cylinders; installation of cylinders.

1.03 PRICE AND PAYMENT PROCEDURES
   A. See Section 01 2100 - Allowances, for allowances affecting this section.

1.04 REFERENCE STANDARDS
   C. BHMA A156.1 - American National Standard for Butts and Hinges; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.1).
   D. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.2).
   E. BHMA A156.3 - American National Standard for Exit Devices; Builders Hardware Manufacturers Association; 2001 (ANSI/BHMA A156.3).
   F. BHMA A156.4 - American National Standard for Door Controls - Closers; Builders Hardware Manufacturers Association, Inc.; 2000 (ANSI/BHMA A156.4).
   G. BHMA A156.6 - American National Standard for Architectural Door Trim; Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.6).
   H. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; Builders Hardware Manufacturers Association, Inc.; 2005 (ANSI/BHMA A156.8).
   I. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.18).
   J. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2004.
1.05 ADMINISTRATIVE REQUIREMENTS
   A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.
   B. Convey Owner’s keying requirements to manufacturers.
   C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by all affected installers.

1.06 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Manufacturer’s catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.
   C. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.
   D. Keying Schedule: Submit for approval of Owner.
   E. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.
   F. Warranty: Submit manufacturer’s warranty and ensure that forms have been completed in Owner’s name and registered with manufacturer.

1.07 QUALITY ASSURANCE
   A. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with Five years of experience.

1.08 DELIVERY, STORAGE, AND HANDLING
   A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.09 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 DOOR HARDWARE - GENERAL
   A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
   B. Provide all items of a single type of the same model by the same manufacturer.
   C. Provide products that comply with the following:
      1. Applicable provisions of federal, state, and local codes.
      2. ADA Standards for Accessible Design.
      5. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
      6. Hardware for Smoke and Draft Control Doors (Indicated as “S” on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.
D. Function: Lock and latch function numbers and descriptions of manufactures series as listed in hardware schedule.

E. Finishes: All door hardware the same finish unless otherwise indicated.
1. Primary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
2. Secondary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
   a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.
3. Finish Definitions: BHMA A156.18.
4. Exceptions:
   a. Where base metal is specified to be different, provide finish that is an appearance equivalent according to BHMA A156.18.
   c. Door Closer Covers and Arms: Color to be selected by Architect from manufacturer's standard colors.
   d. Aluminum Surface Trim and Gasket Housings: Anodized to match door, not to match other hardware.

F. Fasteners:
1. Concrete and Masonry Substrates: Stainless steel machine screws and lead expansion shields.

2.02 HINGES
A. Hinges: Provide hinges on every swinging door.
1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
2. Provide ball-bearing hinges at all doors having closers.
3. Provide hinges in the quantities indicated.
4. Provide non-removable pins on exterior outswinging doors.
5. Where electrified hardware is mounted in door leaf, provide power transfer hinges.

B. Quantity of Hinges Per Door:
1. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.
2. Doors over 120 inches (3 m) High: One additional hinge per each additional 30 inches (762 mm) in height unless specified otherwise.

C. Manufacturers - Hinges:
5. Substitutions: See Section 01 6000 - Product Requirements.

2.03 PUSH/PULLS
A. Push/Pulls: Comply with BHMA A156.6.
1. Provide push and pull on doors not specified to have lockset, latchset, exit device, or auxiliary lock.
2. On solid doors, provide matching push plate and pull plate on opposite faces.

B. Manufacturers - Push/Pulls:
4. Substitutions: See Section 01 6000 - Product Requirements.
2.04 LOCKS AND LATCHES

A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
- Hardware Sets indicate locking functions required for each door.
- If no hardware set is indicated for a swinging door provide an office lockset.
- Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
- Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.

B. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
- Provide cams and/or tailpieces as required for locking devices required.

C. Keying: Grand master keyed.
- Key to existing keying system.

D. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

2.05 CYLINDRICAL LOCKSETS

A. Locking Functions: As defined in BHMA A156.2, and as follows:
- Always-Locked: F86, key required to lock, may not be left unlocked.

B. Manufacturers - Cylindrical Locksets:
- Assa Abloy Corbin Russwin, Sargent, or Yale: www.assaabloydss.com.
- Substitutions: See Section 01 6000 - Product Requirements.

2.06 FLUSHBOLTS

A. Flushbolts: Lever extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.
- Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
- Floor Bolts: Provide dustproof strike except at metal thresholds.

B. Self-Latching Flushbolts: Automatically latch upon closing of door; manually retracted.

C. Coordinators: Provide on doors having closers and self-latching or automatic flushbolts to ensure that leaves close in proper order.

D. Manufacturers - Flushbolts:
- Substitutions: See Section 01 6000 - Product Requirements.

2.07 EXIT DEVICES

A. Locking Functions: Functions as defined in BHMA A156.3, and as follows:
- Entry/Exit, Always-Latched: Key outside locks and unlocks lever, no latch holdback (dogging).

B. Manufacturers:
- Assa Abloy Corbin Russwin, Sargent, or Yale: www.assaabloydss.com.
2.08 CLOSERS
A. Closers: Complying with BHMA A156.4.
   1. Provide surface-mounted, door-mounted closers unless otherwise indicated.
   2. Provide a door closer on every exterior door.
   3. Provide a door closer on every fire- and smoke-rated door. Spring hinges are not an acceptable self-closing device unless specifically so indicated.
   4. On pairs of swinging doors, if an overlapping astragal is present, provide coordinator to ensure the leaves close in proper order.
   5. At outswinging exterior doors, mount closer in inside of door.
B. Manufacturers - Closers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.09 STOPS AND HOLDERS
A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.
   1. Provide wall stops, unless otherwise indicated.
   2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.
   3. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.
B. Wall Stops:
C. Manufacturers - Wall and Floor Stops/holders:
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.10 GASKETING AND THRESHOLDS
A. Thresholds:
   1. At each exterior door, provide a threshold unless otherwise indicated.
   2. Field cut threshold to frame for tight fit.
B. Fasteners At Exterior Locations: Non-corroding.
C. Manufacturers - Gasketing and Thresholds:
   4. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION
A. Install hardware in accordance with manufacturer's instructions and applicable codes.
B. Use templates provided by hardware item manufacturer.
C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.
D. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:
   1. For steel doors and frames: Comply with DHI “Recommended Locations for Architectural Hardware for Steel Doors and Frames.”
   2. For steel doors and frames: See Section 08 1113.

3.03 FIELD QUALITY CONTROL
   A. Field inspection and testing will be performed under provisions of Section 01 4000.

3.04 ADJUSTING
   A. Adjust work under provisions of Section 01 7000.
   B. Adjust hardware for smooth operation.

3.05 CLEANING
   A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.06 PROTECTION
   A. Protect finished Work under provisions of Section 01 7000.
   B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION
SECTION 08 8000

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Glass.

1.02 RELATED REQUIREMENTS
A. Section 07 2500 - Weather Barriers.
B. Section 07 9005 - Joint Sealers: Sealant and back-up material.
C. Section 08 1113 - Hollow Metal Doors and Frames: Glazed doors and borrowed lites.
D. Section 08 3613 - Sectional Doors.

1.03 REFERENCE STANDARDS
F. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 2009.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

1.05 QUALITY ASSURANCE
B. Installer Qualifications: Company specializing in performing the work of this section with minimum __________ years documented experience.

1.06 FIELD CONDITIONS
A. Do not install glazing when ambient temperature is less than 50 degrees F (10 degrees C).
B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS
2.01 GLAZING TYPES
A. Type IG-1 - Sealed Insulating Glass Units: Vision glazing.
   1. Application(s): All exterior glazing unless otherwise indicated.
   2. Outboard Lite: Fully tempered float glass, 1/4 inch (6 mm) thick, minimum.
      a. Tint: Clear.
   3. Inboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
      a. Tint: Clear.
   4. Total Thickness: 1 inch (25 mm).

2.02 EXTERIOR GLAZING ASSEMBLIES
A. Structural Design Criteria: Select type and thickness to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ________ code.
   1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
   2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
   3. Thicknesses listed are minimum.
B. Air and Vapor Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier:
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.
   2. To maintain a continuous air barrier and vapor barrier throughout the glazed assembly from glass pane to heel bead of glazing sealant.

2.03 GLASS MATERIALS
A. Float Glass Manufacturers:
   4. Substitutions: Refer to Section 01 6000 - Product Requirements.
B. Float Glass: All glazing is to be float glass unless otherwise indicated.

2.04 SEALED INSULATING GLASS UNITS
A. Manufacturers:
   1. Any of the manufacturers specified for float glass.
   2. Substitutions: Refer to Section 01 6000 - Product Requirements.
B. Sealed Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Edge Spacers: Aluminum, bent and soldered corners.
   3. Edge Seal: Glass to elastomer with supplementary silicone sealant.
   4. Purge interpane space with dry hermetic air.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that openings for glazing are correctly sized and within tolerance.
B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION
A. Clean contact surfaces with solvent and wipe dry.
B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

3.03 MANUFACTURER’S FIELD SERVICES

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
B. Monitor and report installation procedures and unacceptable conditions.

3.04 CLEANING

A. Remove glazing materials from finish surfaces.
B. Remove labels after Work is complete.
C. Clean glass and adjacent surfaces.

3.05 PROTECTION

A. After installation, mark pane with an ‘X’ by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

3.06 SCHEDULE

A. Hollow Steel Frames - Interior: Interior wet method with Type [___] compound.
   1. Fire-rated openings: Wired glass, 6 mm thick.

END OF SECTION
PART 1  GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, varnishes, and other coatings.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Mechanical and Electrical:
      a. In finished areas, paint all conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically so indicated.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
B. Section 05 5000 - Metal Fabrications: Shop-primed items.
C. Section 05 5100 - Metal Stairs: Shop-primed items.

1.03 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS


1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category
1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

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

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

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

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Paints:

C. Primer Sealers: Same manufacturer as top coats.

D. Block Fillers: Same manufacturer as top coats.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
   1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each coating material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content:
   1. Provide coatings that comply with the most stringent requirements specified in the following:
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings
   1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint EC-OP - All Exterior Concrete and Masonry Surfaces Indicated to be Painted, Unless Otherwise Specified: Including concrete, concrete masonry, brick, cement board, and _____.
   1. Preparation as specified by manufacturer.
   2. Two top coats and one coat primer recommended by manufacturer.
   3. Primer On Concrete and Concrete Masonry: One heavy coat latex block filler (100 percent acrylic) squeegeed into pores.

B. Paint CE-OP-3L - Masonry/Concrete, Opaque, Latex, 3 Coat:
   1. One coat of block filler.
   2. Semi-gloss: Two coats of latex enamel; ____.

C. Paint ME-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
   1. One coat of latex primer.
   2. Gloss: Two coats of latex enamel; ____.

D. Paint ME-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Gloss: Two coats of alkyd enamel; ____.

E. Paint ME-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Gloss: Two coats of latex enamel; ____.

F. Paint MgE-OP-3L - Galvanized Metals, Latex, 3 Coat:
   1. One coat galvanize primer.
   2. Gloss: Two coats of latex enamel; ____.

G. Paint E-Pav - Pavement Marking Paint:
   1. Yellow: One coat, with reflective particles; to match existing.

2.04 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - All Interior Surfaces Indicated to be Painted, Unless Otherwise Specified: Including concrete masonry, uncoated steel, shop primed steel, and galvanized steel.
   1. Two top coats and one coat primer.
   2. Top Coat(s): MPI Institutional Low Odor/VOC Interior Latex; MPI #143-148.
   3. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
   4. Primer(s): As follows unless other primer is required or recommended by manufacturer of top coats:
a. All Substrates: MPI #149, Institutional Low Odor/VOC Primer Sealer, unless a different primer is specified.
b. Concrete Masonry: MPI #4, Latex Block Filler; heavy coat squeegeed into pores.
c. Steel, Uncoated: MPI #107, Rust-Inhibitive Water Based Primer.
d. Steel -- Shop Primer: MPI #76, Quick Dry Alkyd Primer for Metal.
e. Galvanized Steel: MPI #134, Water Based Galvanized Primer.

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
1. Two top coats and one coat primer.
2. Top Coat(s): MPI Interior Epoxy-Modified Latex; MPI #115, 215.
3. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
4. Primer(s): As recommended by manufacturer of top coats.

C. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, and metal fabrications.
1. Shop primer by others.
2. One top coat; white.
3. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

2.05 ACCESSORY MATERIALS
A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
B. Patching Material: Latex filler.
C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION
3.01 EXAMINATION
A. Do not begin application of coatings until substrates have been properly prepared.
B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
D. Test shop-applied primer for compatibility with subsequent cover materials.
E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
   2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
   3. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
   4. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION
A. Clean surfaces thoroughly and correct defects prior to coating application.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
D. Seal surfaces that might cause bleed through or staining of topcoat.
E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

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

G. Aluminum Surfaces to be Painted: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

H. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

I. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-PC 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).

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

K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

L. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

3.03 APPLICATION

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

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

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

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

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

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and
remove daily from site.

3.06 PROTECTION
A. Protect finished coatings until completion of project.
B. Touch-up damaged coatings after Substantial Completion.

3.07 SCHEDULE - PAINT SYSTEMS
A. Concrete, Concrete Block, Brick Masonry: Finish all surfaces exposed to view.
B. Steel Doors and Frames: Finish all surfaces exposed to view; MI-OP-3A, gloss.
C. Steel Fabrications: Finish all surfaces exposed to view.
D. Shop-Primed Metal Items: Finish all surfaces exposed to view.

3.08 SCHEDULE - COLORS
A. Doors and frames to match interior surface of exterior insulated metal panels.
B. CMU walls to be SW 6804 Dignity Blue provide mockup sample on wall for Owner approval prior to installation.

END OF SECTION
SECTION 10 14 26
POST AND PANEL SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Non-illuminated post and panel signs.

1.02 STANDARD REFERENCE

A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans and specifications are to be used in tandem; where one conflicts with the other, the most costly and higher quality requirement will govern.

B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".
   1. Refer to Section 615 “Traffic Signs”

C. Manual on Uniform Traffic Control Devices

1.03 DEFINITIONS


1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for post and panel signage.
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Provide message list, typestyles, graphic elements, and layout for each sign at least half size and full-size details of graphics.
      a. Include full-size templates for cutout characters and graphic symbols.

C. Samples: For each sign type and post for each color and texture required.
1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines, ICC/ANSI A117.1 and NH DOT.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H38.

1. Aluminum Sheet: 0.080 inch (2 mm) thick.
   b. Color: As shown in MUTCD reference or by Owner.


B. U-channel post: Steel “U” posts shall be rail steel conforming to the requirements of ASTM A 499, Grade 60.

2.02 PANEL SIGNS

A. Aluminum Finish:

1. Aluminum shall be properly degreased and etched or treated in accordance with ASTM B 449, Class 2.

B. Other Finishes:

1. Copy and colors shall meet the specifications for NH DOT section 615.2.9.3 Type C signs.

2.03 POSTS

A. General: Fabricate posts to lengths required for mounting method indicated.

1. Direct-Burial Method: Provide posts 36 inches (910 mm) longer than height of sign to permit direct embedment in soil.

B. Steel Posts:

1. Minimum yield strength: 60,000 psi

2. Shall conform to ASTM A-499 (Class 60) or ASTM A-576 (Grade 1070-1078).

3. Weight per foot:
a. Minimum 1/2 lb.

b. Maximum 3 lbs.

4. Holes:

a. 3/8 inch (9.5mm) drilled or punched before painting along center line.

1) Holes to begin 1 inch (25 mm) from the top and continue at 1 in (25 mm) centers the entire length of the post.

2.04 FABRICATION

A. General: Provide manufacturer's standard post and panel signs of configurations indicated.

1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.

2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.

3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.05 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

B. Factory Priming for Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.

1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Excavation: Excavate for sign foundation to elevations and dimensions indicated. Reconstruct subgrade that is not firm, undisturbed, or compacted soil, or that is damaged by
freezing temperatures, frost, rain, accumulated water, or construction activities by excavating a further 12 inches (300 mm), backfilling with satisfactory soil, and compacting to original subgrade elevation.

B. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.

2. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

3.02 RELOCATION

A. CONTRACTOR shall remove, stockpile and reinstall existing signs to be reused as indicated on the Contract Plans.

B. CONTRACTOR shall clean sign surfaces and posts. Damaged signs and/or posts shall be replaced at the Contractors expense. Determination of damaged signs and posts shall be made by the Architect.

C. Install relocated signs per section 3.01.

END OF SECTION
SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1  GENERAL

1.01 SECTION INCLUDES
A. Fire extinguishers.
B. Fire extinguisher cabinets.

1.02 RELATED REQUIREMENTS
A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide extinguisher operational features.
C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.05 FIELD CONDITIONS
A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2  PRODUCTS

2.01 MANUFACTURERS
A. Fire Extinguishers:
B. Fire Extinguisher Cabinets and Accessories:
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS
A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL for the purpose specified and indicated.
B. FE-36 Type Fire Extinguishers: Stainless steel tank, with pressure gage.
   1. Class: A:B:C.
   2. Size: 10 pound (4.54 kg).
   3. Size and classification as scheduled.
   4. Finish: Baked polyester powder coat, ____ color.
   5. Temperature range: -40 degrees F (-40 degrees C) to 120 degrees F (49 degrees C).

2.03 FIRE EXTINGUISHER CABINETS
A. Metal: Formed primed steel sheet; 0.036 inch (0.9 mm) thick base metal.
B. Cabinet Configuration: Surface type.
   1. Sized to accommodate accessories.
C. Door: 0.036 inch (0.9 mm) thick, reinforced for flatness and rigidity; lock with break glass access. Hinge doors for 180 degree opening with two butt hinge. Provide nylon catch.
D. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.
E. Finish of Cabinet Interior: White enamel.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify existing conditions before starting work.
B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION
A. Install in accordance with manufacturer’s instructions.
B. Install cabinets plumb and level in wall openings, ____ inches (____ mm) from finished floor to inside bottom of cabinet.
C. Secure rigidly in place.
D. Place extinguishers and accessories in cabinets.

END OF SECTION
PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Description of Fire Suppression system(s), quality expectations, materials and general requirements.

1.2 SYSTEM(S) DESCRIPTION
A. Furnish and install all labor and materials, including all incidentals required, to provide 100% approved automatic sprinkler coverage of the new addition as defined on the architectural drawings, drawing FP1.1 and as specified hereinafter.

1.3 RELATED DIVISIONS and SECTIONS
A. DIVISION 00 - Procurement and Contracting Requirements
B. DIVISION 01 - General Requirements
C. DIVISION 02 - Existing Conditions
D. DIVISION 07 - Thermal and Moisture Protection
E. DIVISION 22 - Plumbing
F. DIVISION 23 - Heating, Ventilating and Air-Conditioning (HVAC)
G. DIVISION 25 - Integrated Automation
H. DIVISION 26 - Electrical

1.4 REFERENCES
A. 2009 International Building Code
C. New Hampshire State Fire Code
D. 2009 NFPA 1, National Fire Code, as adopted and amended by NH State Fire Code
E. 2009 International Plumbing Code with NH amendments
F. 2009 International Mechanical Code
G. 2009 International Energy Conservation Code
H. 2008 with 2009 amendments NFPA 70, National Electric Code
I. City of Manchester, New Hampshire ordinances, rules and regulations
J. Manchester Fire Department rules and regulations
K. All applicable ASTM Standards

1.5 SUBMITTALS
A. See SECTION 01330 - Administrative Requirements, for submittal procedures.

END OF SECTION 210000
PART 1 - GENERAL

1.1 INTENT

A. Furnish and install all labor and materials, including all incidentals required, to provide 100% approved automatic sprinkler coverage of the new addition as defined on the architectural drawings, FP1.1 drawing and specified herein.

1.2 CODES AND PERMITS (In accordance with SECTION 01400)

A. All work under this contract shall comply fully with requirements, rules and regulations of Agencies Having Jurisdiction (AHJ) including, but not limited to, the City of Manchester, New Hampshire, and the Owner’s insurance company.

B. Any changes that must be made to finished work to conform with regulations and codes shall be made at the Sprinkler Contractor’s expense.

C. Any conditions noted in the specifications which would be contrary to such regulations shall be brought to the attention of the Owner’s representatives before work is installed.

D. Permits and fees shall be obtained and paid for by the Sprinkler Contractor.

E. Submit detailed construction drawings and have them approved by AHJ before installation. Obtain certification of inspection and approval from same agency.

1.3 GUARANTEE

A. The Sprinkler Contractor shall leave the entire Sprinkler System installed under this contract in proper working order and shall, without additional charge, replace any work or material installed which develops defects within one year from the date of final acceptance by the Owner’s representatives, including all other work damaged by such defects.

B. Any apparatus that requires excessive service during the first year of operation shall be considered defective and shall be replaced.

1.4 DRAWINGS AND SPECIFICATIONS

A. Any questions regarding specifications shall be addressed to the Architect before the bids close. After the closing of bids, the Owner’s representative’s interpretation of the meaning and intent of drawings and specifications shall be final.

1.5 APPROVALS

A. The Sprinkler Contractor shall obtain approval of the layout from the Manchester Fire Department and Yeaton Associates.
B. After satisfactory final inspection and test by the AHJ, a copy of the letter of acceptance shall be filed with the Owner’s representatives.

1.6 CUTTING, PATCHING, EXCAVATING AND BACKFILLING

A. Cutting and patching shall be in accordance with the Sprinkler Contractor and General Contractor contractual agreement.

B. Pipe penetrations through all rated assemblies shall be fire-stopped as required to meet or exceed applicable UL criteria (including UL Design 905), and DIVISION 07.

END OF SECTION 210100
PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The Sprinkler System Scope of Work shall include, but not be limited to, the following:
   1. Complete and detailed working drawings and hydraulic calculations prepared by a duly recognized Professional Engineer or NICET level 3 Certified designer.
   2. Flow test in cooperation with the Manchester Water Works.
   3. Valve station; alarms and tamper switches.
   4. Drain and test connections (piped to grade).
   5. Sprinklers and fittings.
   6. Supports, hangers and inserts; seismic bracing.
   7. Valves and gauges.
   8. Valve seals, tags and charts.
  10. Securement of all permits and submission of test results to the Manchester Fire Department as required by municipal construction codes.
  11. “SPRINKLER CONTROL VALVE” clearly indicated on the door of the Sprinkler Room (if located in a separate room or concealed space).
  12. Coordination of Fire Alarm System points with the Electrical Contractor.
  13. A set of hydraulic calculations submitted to the Manchester Fire Department.
  14. Connection to existing sprinkler service per drawing FP1.1.
  15. Sequencing of work to maintain existing system operation.
  16. Secure all required permits.

END OF SECTION 210500
PART 1 - GENERAL

1.1 MATERIALS AND SUBSTITUTIONS

A. Sprinkler equipment shall be new and conform to the standards established in these specifications, and selected from “List of Inspected Fire Protection Equipment and Materials”, published annually by UL and shall bear UL approved stamp or label.

B. Trade names and specific manufacturers’ model numbers define type and quality of materials and equipment required.

C. Bid shall include all methods, materials, equipment, etc. as required to provide a complete installation.

D. Uniformity - Unless otherwise specified, equipment or materials of the same type or classification used for the same purpose shall be the product of the same manufacturer.

E. Materials, products not approved may not be used in construction.

1.2 WORKMANSHIP

A. All work shall be executed in a workmanlike manner and shall present a neat, mechanical appearance when completed. Work not approved by the Owner’s representatives shall be replaced by the Sprinkler Contractor without additional charge.

B. All piping, in general, shall be run as straight and direct as possible, forming right angles or parallel lines with the building walls and other pipes, and be neatly spaced. Check closely with other trades to prevent interferences. No claims will be allowed for extra work caused by failure to coordinate with others.

END OF SECTION 210600
PART 1 - GENERAL

1.1 COMMISSIONING OF SYSTEM(S)

A. The Sprinkler Contractor shall be responsible for self-commissioning the installed sprinkler system(s) in accordance with NFPA 13 described procedures, Manchester Fire Department requirements and best trade practices.

1.2 TESTS AND FLUSHING

A. After completion, subject sprinkler system to tests required by and in the presence of representatives of Manchester, New Hampshire Fire Department and Owner’s representatives. Conduct, duration and other details not covered by agencies’ requirements, shall be in accordance with NFPA 13, AHJ adopted edition.

B. Provide instruments, equipment, and pay expenses incurred in making test; obtain approvals, certificates.

C. The system shall be thoroughly flushed before sprinklers are in place in order to free the system from any obstructing material which might clog the orifices of the sprinklers.

D. Where evidence of stoppage appears in piping or equipment, disconnect, clean, repair, and reconnect obstructed parts. The Sprinkler Contractor shall bear cost of cuttings, patching and all other work necessitated by such cleaning and repairing.

END OF SECTION 210800
PART 1 - GENERAL

1.1 REQUIREMENTS

A. The sprinkler contractor shall extend the existing wet based system as required to address the new addition inclusive of two (2) new zones.

B. Sprinkler heads installed in tile ceilings shall be centered in the tile and shall be installed in straight lines. Contractor shall provide preliminary drawings for review by the Architect prior to hydraulic calculations.

C. This contractor must have full regard for the Architect’s intent to rearrange any exposed piping and/or heads to achieve aesthetic requirements. Extra heads and piping necessary to suit the desired placement shall be provided at no additional cost. Final layout shall comply with NFPA 13, AHJ adopted edition and provide a neat and orderly layout along steel members. The Architect reserves the right to mark-up shop drawings with preferred pipe routes and head layouts.

D. The intent is that all piping will be run exposed in general construction.

E. Sprinkler equipment acceptable: Tyco, Victaulic, AGF, Potter, Viking or approved equal.

1.2 PIPING CONNECTIONS

A. The Sprinkler Contractor’s work shall begin at appropriate points of connection to the existing risers and a new riser installed as part of this contract.

1.3 SPRINKLERS

A. Sprinkler Heads:
   1. For exposed applications in unfinished areas, and where exposed in finished areas, use natural brass finish (subject to Architect’s approval) pendant or sidewall heads of temperature rating and response type required. Approval of Architect required prior to ordering. Submit sample.
   2. In areas where heads are subject to damage, provide guards. Submit sample.
   3. For finished ceiling and wall applications, use white finish semirecessed ceiling or sidewall heads with rating bulb and matching escutcheon, of temperature rating and response type required. Approval of Architect required prior to ordering. Submit sample.
   4. Use quick response heads as required by NFPA 13 and/or the AHJ.

B. Furnish extra sprinkler heads packed in suitable container along with sprinkler wrenches, per NFPA 13, AHJ adopted edition.

END OF SECTION 211000
PART 1 - GENERAL

1.1 PIPING MATERIALS, FITTINGS AND JOINTS

A. Sprinkler System piping material and installation practices shall conform to NFPA 13, AHJ adopted edition.

1.2 ANCHORS, SUPPORTS AND HANGERS

A. Support sprinkler piping from building structure by means of hangers, inserts, etc., as required by NFPA 13, AHJ adopted edition.

B. Hangers shall be split ring (clevis not acceptable) fastened to structure, and shall be designed to meet all applicable seismic criteria. Provide submittal for aesthetic review by the Architect.

C. Address seismic restraints and hanging criteria as it applies within the existing hospital. Secure the services of a professional seismic consultant to review and design as required, plus administer construction/installations.

1.3 PIPE SLEEVES, ESCUTCHEONS

A. Provide proper sleeves to accommodate pipes passing through walls, floors, partitions, and provide escutcheons at exposed finished surfaces pierced by pipes. The Sprinkler Contractor shall not cut through any beams without written permission from the Owner’s representative.

B. Extend sleeves 1½” above finished floor and pack space between pipe and sleeve as recommended in NFPA 13, AHJ adopted edition.

1.4 VALVES AND GAUGES

A. Control valves for sprinkler system: IBBM, solid wedge gate, rising stem OS&Y for 175 psi W.W.P. Install at entry station with electrically wired tamper switch. Wiring of each switch to an alarm provided by Electrical Contractor.

B. Provide approved gauges as required per NFPA 13, and approving authority.

C. Tamper switches shall be furnished and installed by Sprinkler Contractor, wired by the Electrical Contractor.


1.5 VALVE SEALS, TAGS AND CHARTS

A. Provide copper wire and approved seal for each manually operated shut-off valve required to be sealed in open position.
B. Provide identification signs of standard design, fastened securely at designated locations as per NFPA 13, and Manchester, New Hampshire Fire Department.

C. Provide brass tags about 2” in diameter; stamp with designating number, secure with 12 gauge copper wire to spindle of all control valves.

D. Provide electronic data and paper copies of drawings, calculations, equipment cuts and other operations and maintenance information as called for in DIVISION 01.

END OF SECTION 211100
PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Description of Plumbing system(s), quality expectations, materials and general requirements.

1.2 PLUMBING DEMOLITION

A. This trade shall remove all existing piping, equipment and other plumbing specialties noted on the drawings and/or required to achieve the intent of this contract. No unused equipment, piping or specialties shall be abandoned in place. All removed equipment shall be hauled away from the site and disposed of properly, except where noted to be reused or directed otherwise in the field. Manchester Community College reserves the right of first refusal on all removed equipment and specialties.

B. Coordinate the limits of demolition work to be performed by this trade with the General Contractor (G.C.), as certain removals will be performed by the Demolition Trade.

C. The Contractor may not engage in the sale of any salvaged mechanical equipment, piping, materials or specialties on Manchester Community College property.

D. This Contractor is required to coordinate all shutdowns through the General Contractor and must maintain system continuity and operation during occupied hours.

1.3 SYSTEM(S) DESCRIPTION

A. Plumbing systems of this contract shall include:
   1. System of sanitary waste and vent from each fixture to points of connection as indicated on the Plumbing drawings.
   2. Systems of domestic hot and cold water distribution to all fixtures from mains where indicated.
   3. Hot water recirculation system.
   4. Fixtures as specified and/or indicated.
   5. Thermal insulation for all systems.
   6. Testing and adjusting of all systems.
   7. General Conditions of the contract.
   8. Roof drainage system.
   9. Natural gas distribution system.
   10. Compressed air systems.
   11. Secure all required permits.

1.4 RELATED DIVISIONS and SECTIONS

A. DIVISION 00 - Procurement and Contracting Requirements
B. DIVISION 01 - General Requirements
C. DIVISION 02 - Existing Conditions
D. DIVISION 07 - Thermal and Moisture Protection
E. DIVISION 21 - Fire Suppression
F. DIVISION 23 - Heating, Ventilating and Air-Conditioning (HVAC)
G. DIVISION 25 - Integrated Automation
H. DIVISION 26 - Electrical

1.5 REFERENCES
A. 2009 International Building Code
C. New Hampshire State Fire Code
D. 2009 NFPA 1, National Fire Code, as adopted and amended by NH State Fire Code
E. 2009 International Plumbing Code with NH amendments
F. 2009 International Mechanical Code
G. 2009 International Energy Conservation Code
H. 2008 NFPA 70, National Electric Code
I. City of Manchester, New Hampshire ordinances, rules and regulations
J. Manchester Fire Department rules and regulations
K. All applicable ASTM Standards

1.6 SUBMITTALS
A. See SECTION 01 30 00 - Administrative Requirements, for submittal procedures.

END OF SECTION 220000
PART 1 - GENERAL

1.1 INTENT

A. Furnish and install all plumbing work of this contract in accordance with governing codes and in a workmanlike manner.

B. The run and arrangement of all plumbing pipes shall be approximately as shown on the drawings and as directed during installation and shall be as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and be neatly spaced.

C. Arrange work to avoid all interference with the work of all other trades. Consult with other contractors, and coordinate the location of their work with that of the others.

1.2 COLD WATER SYSTEMS

A. Cold water distribution systems shall supply water to all fixtures and other water consuming equipment and hot water heating equipment. Valved outlets for the use of other trades shall be furnished and installed complete.

1.3 GENERAL INSTALLATION OF PLUMBING PIPING

A. The majority of the building has exposed structure with no ceiling. All pipe hangers etc., layouts shall be reviewed and approved by the Architect and Engineer in advance of installation.

B.Offsets shall be permitted only where required to permit the pipes to follow walls, where standard fittings shall be used.

C. All risers shall be erected plumb and true and shall be parallel with walls and other pipes and be neatly spaced.

D. All roughing, underground or concealed in floors or wall construction, shall be installed before the construction is closed up.

E. Horizontal runs of piping, except where concealed in partitions, shall be kept as high up as possible and close to walls. Consult with other trades so that grouped lines shall not interfere with each other.

F. The arrangement, positions and connections of pipes, fixtures, drains and valves shown on the drawings shall be followed as closely as possible. However, the right is reserved by the Owner’s representative to change locations of pipes and associated specialties to accommodate any conditions which may arise during the progress of the work, without additional cost. The responsibility for accurately laying out the work rests with the contractor.
G. Piping shall be installed concealed in building construction in all finished areas.
   1. Special precaution shall be taken in the installation of piping concealed to see that
      the piping is properly installed. Should it be necessary to correct piping so
      installed, this subcontractor shall be held liable for any injury caused to other
      work and the correction of piping.

H. Pipe shall not be bent, flattened or otherwise injured either before installation or during
   installation.

I. Connections to fixtures shown to be installed concealed in building construction shall, in
   general, be carried concealed to a point above floor at wall (near fixtures), where they
   shall break out and rise exposed to fixtures, all as required. Exposed waste and supplies
   (including in cabinets) shall be chrome, except for kitchen work sinks. The chrome
   tailpiece connection to plumbing roughed behind the cabinet shall be a threaded
   compression fitting with extended escutcheon.

J. Reducing fittings, unless otherwise approved in special cases, shall be used in making
   reduction in size of pipe. Bushing shall not be allowed unless specifically approved.

1.4 PLUMBING WATER PIPING CONSTRUCTION DETAILS

A. Pipe shall be supported as specified hereinafter.

B. Pipe lines shall be run parallel and spaced to permit proper covering.

C. Air chambers shall be Wade "Shok-Stop" or approved equal, and shall be installed on
   top of all hot and cold water risers on the upfeed system, on all individual hot and cold
   water fixture branch connections. Groups of fixtures may be served by one full branch
   sized air chamber.

D. Piping, fittings, valves, supports, hangers, etc., exposed to view shall be painted or
   chrome as directed. This provision shall apply to all piping from the point that it leaves
   the wall to the point of final connection to the fixture.

E. Any exposed piping and trim showing tool marks shall be removed and replaced with
   new materials without additional cost.

F. Riser control valves shall be provided on all risers. Drain valves shall be provided at the
   heel of each riser inside of shut-off valves.

G. Main shut-off valves shall be installed at each water connection at all tanks and other
   pieces of equipment.

H. Valves shall generally be provided on all main branches from risers to groups of fixtures
   and access doors shall be provided to all such valves not readily accessible.

I. Piping shall pitch to low points. All low points and any pockets caused by changes in
   elevation required by structural or other interferences shall be provided with drain
   valves.
J. Branches to individual fixtures shall be of sizes as shown in the Fixture Schedule on the drawings.

K. Vacuum breakers and backflow preventers shall be installed on all equipment and fixture connections as required by code and/or local ordinances.

L. Connections to equipment such as tanks, pumps, and the like, shall be made with flanged or union connections.

M. Where hot and cold water supply pipes connect to a combination supply fitting with a shut-off valve on its discharge, or the combination supply fitting is equipped with manual or thermostatic mixing valve, each hot and cold water supply pipe shall be equipped with a composition disc swing check valve ahead of the supply fitting.

1.5 SANITARY SEWER AND DRAINAGE SYSTEM

A. Complete system of sanitary sewer and drainage shall be provided. The system shall include all risers, branches with all pipes, fittings, hangers, anchors, plumbing fixtures, special fixture wasters, etc., to make the system complete.

B. Branch connections shall be made with "Wye" and long "Tee-Wye" fittings. All fittings shall conform to code requirements.
   1. Short 1/4 bends, common offsets and double hubs will not be permitted.
   2. Short "Tee-Wye" fittings are to be used in vertical piping only.

C. Drains shall be run at minimum grade of 1/8" per foot downward in the direction of flow unless otherwise indicated. Branch connections to stacks from fixtures shall pitch 1/4" per foot. Attention is called to the strict necessity of maintaining the ceiling heights posted on the architectural drawings, as well as keeping piping close to steal beams and girders where exposed.

1.6 VENT SYSTEMS

A. Complete systems of ventilating pipes shall be installed from the various new plumbing fixtures and other equipment to which drainage connections are made.
   1. Ventilating pipes shall be connected to the discharge of traps as shown.
   2. Carry vents individually to a point above the ultimate overflow level of the fixtures before connecting with any other vent pipe; in general, this will be approximately 42" above the finished floor.
   3. Branches shall be arranged to pitch back to fixtures.

B. Individual vent pipes shall be collected together in branch vent lines and connected to vent stacks in general, paralleling soil and waste stacks.
   1. Wherever possible, vent stack offsets shall be connected to adjacent soil stacks for the purpose of draining condensation.
   2. Where possible, the waste of a fixture shall be connected to the base of each vent stack for the purpose of washing out any scale or dirt which may accumulate.
   3. The soil stack may be used to wash out the heel of the vent.
C. Tops of all soil and waste stacks shall be extended as additional ventilating pipes.
   1. Pipes smaller than 4" size shall be increased to 4" by means of approved increasers before passing through the roof.
   2. The tops of all ventilating stacks shall collect together and run through the roof in series of larger pipes as shown on the drawings.

1.7 NATURAL GAS DISTRIBUTION SYSTEM

A. The entire installation shall be installed in accordance with the requirements of the AHJ and NFPA Pamphlet No. 54 (adopted edition), which are hereby included in and shall form part of this specification.

B. Starting at the gas service provided by the gas utility, or as indicated on the drawings, provide distribution system to all fixtures and equipment requiring gas, including all mains, branches, risers, drips, shut-offs and all other required parts. Connect to all equipment and appliances indicated and/or specified as requiring gas for their operation.

C. Provide a gas shut-off cock at individual pieces of equipment to permit isolation from adjoining system.

D. Install drains at all low points in piping system and secondary regulators noted.

E. Paint all exterior gas piping and exposed interior piping with two (2) coats of rust inhibitor “Caution Yellow” paint. Label all clearly per Specification.

END OF SECTION 220100
SECTION 220500
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor and materials to complete the installation of the plumbing systems as shown on the drawings, specified herein or both as follows:
   1. System of sanitary waste and vent from each fixture to points of connection as indicated on the Plumbing drawings.
   2. Systems of domestic hot and cold water distribution to all fixtures from mains where indicated.
   3. Hot water recirculation system.
   4. Fixtures as specified and/or indicated.
   5. Thermal insulation for all systems.
   6. Testing and adjusting of all systems.
   7. General Conditions of the contract.
   8. Roof drainage system.
   9. Natural gas distribution system.
  10. Compressed air system.
  11. Secure all required permits.

END OF SECTION 220500
PART 1 - GENERAL

1.1 SCOPE

A. Provide shut-off valves to isolate sections of piping, every fixture and equipment. Valves shall be located at the inlet and outlet to permit removal for repairs without interfering with the remainder of the system.

B. Do not locate valves with stems below horizontal. Provide ball, check, balancing cocks, plus air vents and other type of valves as required for complete and proper valving of the entire installation, to control flow, shut-off, prevent backflow, provide drainage and control pressure and temperatures.

PART 2 - PRODUCT

2.1 MATERIAL

A. Valves used for isolation and flow control in domestic water systems shall be bronze construction appropriate for potable water applications, equal to Watts B-6080.

B. Check valves 2½” and less shall be bronze horizontal swing check, 125 swp, equal to Watts B-5000. Check valves 3” and larger shall be iron body, bronze trim, 125 swp, equal to Watts F-511-IBBM.

C. Drain valves to be installed at low points in piping and as otherwise required to completely drain piping system and equipment. Drain valves shall be ball valves of size as shown or required, in no case smaller than ½” I.P.S., equal to Watts B-6000-CC with ¾” male thread for hose, outlet with cap and chain.

D. Approved strainers shall be installed in the inlet connections to equipment and automatic control valves to protect all apparatus or any automatic character whose proper function would be interfered with by dirt on the seat or by scoring of the seat. Strainers shall be equal to Watts series 777 and 77F-D.

E. Valves used in natural gas lines for isolation shall be equal to Watts B-6000-UL-YRPV.

END OF SECTION 220523
PART 1 - GENERAL

1.1 SCOPE

A. Provide suitable and substantial hangers and supports for all horizontal and vertical lines as manufactured by B-Line, Allegheny Industrial, Tolco or ITT Grinnell.

B. Support copper, steel, cast iron and all other material piping in accordance with the pipe manufacturer’s published instructions, or the schedule below, whichever is more stringent.

C. Support piping in accordance with the following schedule:

<table>
<thead>
<tr>
<th>Pipe Material</th>
<th>Max. Horizontal Spacing</th>
<th>Max. Vertical Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper tubing</td>
<td>6’</td>
<td>10’</td>
</tr>
<tr>
<td>1¼” &amp; smaller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper tubing</td>
<td>10’</td>
<td>10’</td>
</tr>
<tr>
<td>1½” &amp; larger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel pipe</td>
<td>12’</td>
<td>15’</td>
</tr>
<tr>
<td>Cast iron</td>
<td>At joint or 10’</td>
<td>At joint</td>
</tr>
<tr>
<td>PVC &amp; CPVC</td>
<td>As recommended by pipe manufacturer.</td>
<td></td>
</tr>
</tbody>
</table>

D. Piping and equipment shall not be hung from the work of other trades.

PART 2 - PRODUCT

2.1 MATERIAL

A. Hangers shall be of heavy construction suitable for the size of pipe to be supported. All materials, except pipe rollers, shall be wrought or malleable iron or steel. Hangers shall be adjustable type.

B. Hangers and pipe clamps used on copper piping shall be solid copper or copper plated. Where tube is in contact with dissimilar metal, protect with shield or plastic cover.

C. The intention is to provide supports which in each case shall be amply strong and rigid for the load, but which shall not weaken or unduly stress the building construction.

D. Hangers for pipes up to and including 4” shall be split ring type.

E. Hangers for pipes above 4” shall be standard clevis or roller.
F. For insulated piping ≥ 3” provide teflon slide type supports MSS (Manufacturer’s Standardization Society) Type 35 or protective saddles MSS Type 39. Fill interior voids of saddles with segments of insulation to match adjoining pipe insulation.

G. For all insulated piping provide protective insulation shields MSS (Manufacturer’s Standardization Society) Type 40 as follows:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Length</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>¼” to 3½”</td>
<td>12”</td>
<td>18 ga.</td>
</tr>
<tr>
<td>4”</td>
<td>12”</td>
<td>16 ga.</td>
</tr>
</tbody>
</table>

END OF SECTION 220529
PART 1 - GENERAL

1.1 SCOPE

A. Address seismic restraints and hanging criteria as required by prevailing codes. Secure the services of a professional seismic consultant to review and design as required, plus administer construction/installations. Refer to Specification Section 230548 for requirements related to Vibration Isolation and Seismic Restraints.

END OF SECTION 220548
PART 1 - GENERAL

1.1 GENERAL

A. Identification shall be provided on all piping that is exposed, as well as at all concealed locations such as shafts and above removable ceilings in which piping may be viewed.
   1. Furnish and affix approved adhesive bands identifying the service and direction of flow of the various piping systems.
   2. A set of such bands shall be affixed to each pipe not less than 30’ and there shall be at least one set of identifying bands in every room where piping may be viewed.
   3. Each set shall consist of one band on which the name of the service is printed and one band on which is printed a black directional arrow.

B. Identification bands shall have adhesive backing. Submit same for approval.
   1. The name of the service shall be printed in black letters not less than 2” high for 3” pipe and larger; 1” high for pipe 2½” and smaller.
   2. Bands shall be applied where they can be read with their long dimension parallel to the axis of the pipe or duct. Bands shall be applied only after finish painting is completed.

1.2 SCOPE

A. Attach to each valve a 2” brass tag on which shall be stamped designating letters and numbers ½” high filled with black enamel. Letters designate service.
   1. The tags shall be securely fastened to the handle or spindle of the valve by a brass chain.
   2. Cross reference valve tags on the “As-Built” drawings and include schedules in the Operation & Maintenance (O&M) manuals.
   3. One (1) copy of the valve schedule shall be provided in the O&M Manual. Review numbering with the Owner’s representative prior to installation and honor any existing numbering systems in force today.

B. Provide nameplates for all equipment, motor starters, push button stations, pilot light stations or control points, and any other points in the building deemed necessary by the Owner’s representative.
   1. Nameplates shall be fabricated from black bakelite with white recessed letters permanently secured with screws.
   2. Nameplate schedule and sample shall be submitted for approval.
   3. Coordinate identification of exhaust fan switches provided by the Electrical Contractor.

C. Provide permanent labels on all pieces of mechanical equipment designating the unit tag as it is shown on mechanical drawings.
D. As part of the Owner Instruction session, review the location of valves, circulators, dampers and other specialties concealed above ceilings. Furnish and install adhesive dots on ceiling tiles (in the corner) for access reference.

<table>
<thead>
<tr>
<th>Dot Color</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>Domestic water</td>
</tr>
</tbody>
</table>

PART 2 - PRODUCT

2.1 MATERIAL

A. Identification bands, tags, charts and dots shall be as manufactured by Seton or Carlton.

END OF SECTION 220553
SECTION 220610
SCHEDULES FOR PLUMBING PIPING AND PUMPS

PART 1 - GENERAL

1.1 MATERIALS - GENERAL

A. Steel pipe shall be lap welded or seamless with maker's name rolled on each length equal to ASTM-A-53 of weight specified.

B. Copper tube shall be seamless, hard or soft equal to ASTM-B88 of type specified.

C. Cast iron soil pipe shall be standard weight coated cast iron soil pipe. Each length shall bear the maker's name, weight per foot and size cast thereon. Fittings and traps shall be similarly marked. Cast iron pipe and fittings shall meet or exceed the requirements of CISPI 301 and 310.

D. PVC pipe and fittings shall meet or exceed the requirements of ASTM D-1784 and 1785.

E. Pumps used in potable water systems shall be bronze construction of manufacturer scheduled, or equal.

PART 2 - PRODUCT

2.1 SCHEDULE OF PLUMBING PIPE MATERIALS

<table>
<thead>
<tr>
<th>Service</th>
<th>Location</th>
<th>Size</th>
<th>Material</th>
<th>Type</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic C.W.,</td>
<td>Building</td>
<td>All</td>
<td>Copper</td>
<td>Hard</td>
<td>Type L</td>
</tr>
<tr>
<td>H.W. &amp; R.H.W.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic C.W.,</td>
<td>Building</td>
<td>Concealed</td>
<td>Watts</td>
<td>Pex</td>
<td>Pex</td>
</tr>
<tr>
<td>H.W. &amp; R.H.W.</td>
<td>Runouts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sanitary Waste &amp; Vent</td>
<td>Exposed</td>
<td>All</td>
<td>C.I.</td>
<td>No Hub</td>
<td>ASTM C656</td>
</tr>
<tr>
<td>&amp; Roof Drain</td>
<td>Within</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Building</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sanitary Waste &amp; Vent</td>
<td>Concealed</td>
<td>All</td>
<td>PVC</td>
<td>DWV</td>
<td>Sch. 40</td>
</tr>
<tr>
<td>&amp; Roof Drainage</td>
<td>Within</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sanitary &amp; Roof Drain</td>
<td>Underground</td>
<td>All</td>
<td>PVC</td>
<td>DWV</td>
<td>Sch. 40</td>
</tr>
<tr>
<td>A.C. Equip, Condensate</td>
<td>All</td>
<td>All</td>
<td>PVC</td>
<td>DWV</td>
<td>Sch. 40</td>
</tr>
</tbody>
</table>

SCHEDULES FOR PLUMBING PIPING AND PUMPS 220610 - 1
### Natural Gas
- Location: All
- Size: All
- Material: Steel
- Type: Screwed or Welded
- Schedule: Sch. 40

### Compressed Air
- Location: All
- Size: All
- Material: Galvanized Steel
- Type: Screwed
- Schedule: Sch. 40

### Oxygen
- Location: All
- Size: All
- Material: Copper
- Type: Hard
- Schedule: Type L

### Acetylene
- Location: All
- Size: All
- Material: Steel
- Type: Screwed
- Schedule: Sch. 80

#### 2.2 SCHEDULE OF PLUMBING PIPE FITTINGS

<table>
<thead>
<tr>
<th>Service</th>
<th>Location</th>
<th>Size</th>
<th>Material</th>
<th>Type</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic C.W., H.W. &amp; R.H.W.</td>
<td>Building</td>
<td>All</td>
<td>W. Copper</td>
<td>Soldered</td>
<td>Lead-free</td>
</tr>
<tr>
<td>Sanitary Waste &amp; Vent &amp; Roof Drain</td>
<td>Exposed Within Building</td>
<td>All</td>
<td>No Hub</td>
<td>S/S Shield &amp; Clamp</td>
<td>ASTM C656</td>
</tr>
<tr>
<td>Sanitary Waste &amp; Vent &amp; Roof Drainage</td>
<td>Concealed Within Building</td>
<td>All</td>
<td>PVC</td>
<td>DWV</td>
<td>Sch. 40</td>
</tr>
<tr>
<td>Sanitary &amp; Roof Drain</td>
<td>Underground</td>
<td>All</td>
<td>PVC</td>
<td>DWV</td>
<td>Sch. 40</td>
</tr>
<tr>
<td>A.C. Equip. Condensate</td>
<td>All</td>
<td>All</td>
<td>PVC</td>
<td>DWV</td>
<td>ASTM 2665</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>All</td>
<td>All</td>
<td>Steel</td>
<td>Screwed or Welded</td>
<td>150#</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>All</td>
<td>All</td>
<td>Galvanized Steel</td>
<td>Screwed</td>
<td>Sch. 40</td>
</tr>
<tr>
<td>Oxygen</td>
<td>All</td>
<td>All</td>
<td>Wrought Copper</td>
<td>Brazed</td>
<td>BCuP-5</td>
</tr>
<tr>
<td>Acetylene</td>
<td>All</td>
<td>All</td>
<td>Malleable Iron</td>
<td>Screwed</td>
<td>150#</td>
</tr>
</tbody>
</table>

**Piping Notes:**
1. No solder containing lead shall be present on site.
2. DWV copper may be used for sanitary waste and vent services 2” and less in lieu of cast iron, except for urinal drains.
3. “ProPress” Fittings or Victaulic copper couplings may be used in lieu of soldered connections in copper piping systems at this contractor’s option.
4. PVC may be used underground if allowed by the City of Manchester Plumbing Code.
5. PEX product must be appropriate and approved for potable water service.

2.3 TRAPS

A. Traps shall be of material and type conforming to the piping system in which installed. Traps shall be of plain pattern, having a seal of not less than 2½”, not greater than 4” except as noted on the drawings. All concealed 2” and larger traps shall be of the material specified for the piping system to which they are connected. All exposed fixture traps are to be as specified under the fixture schedule and or to match equipment tailpieces supplied by others.

2.4 CLEANOUTS

A. Cleanouts for cast iron pipe shall consist of tapped extra heavy cast iron ferrule, caulked into the cast iron fittings, and extra heavy brass tapered screw plug with solid hexagonal nut. The cleanout plugs shall comply with the plumbing code and shall have American Standard pipe threads. Cleanouts turning out through wall and floors shall be made by long sweep ells or “Wye” fittings and 1/8 inch bends; into these caulk the following:
   1. At the heel of each vertical sanitary drain install a “Dandy” cleanout.

B. Cleanouts in cast iron piping systems shall be Zurn models listed below, or of similar standard.
   1. Finished Floors - ZN1400-BP
   2. Carpeted Floors - ZN1400-BP-CM
   3. Unfinished Floors - Z1400-BP
   4. Finished Walls - Z-1441 or Z-1446

C. Cleanouts in PVC piping networks shall be compatible.

2.5 PUMPS

A. Pumps used in potable water systems shall be as manufactured by Bell & Gossett, Armstrong, Taco or equal of type and capacity indicated on the drawings.

PART 3 - EXECUTION

3.1 SOLDERING PIPE

A. Fittings in copper tubing shall be wrought copper for sweat solder joints. Joints in copper water piping shall be made with solder, per schedule, and shall meet ASTM-B32-96AM. Flux shall be equal to Canfield’s SOLDER-MATE and COPPER-MATE. No borax or alcohol mixtures or resin or similar paste fluxes shall be used. Care should be taken to see that no surplus flux is on the inside of the pipe when the joint is completed.

3.2 FIRE SEALANT

A. Fire sealing at all penetrations through rated general construction shall be in accordance with SECTIONS 07841 AND 07920.
B. Pipes passing through all masonry and fire rated gypsum board walls shall pass through clean cut holes fitted with steel pipe sleeves, the inside diameter of which shall be at least 1” greater than the outside of the pipe passing through it. Pipes passing through non-rated gypsum board walls do not require sleeves, but the void between wall opening and pipe must be sealed and taped. Pipe insulation shall be continuous through sleeve/hole and all space between pipe and sleeve/hole shall be caulked full with product per SECTIONS 07841 AND 07920. Installation details shall be in accordance with the sealant manufacturer’s published instructions in order to bear the UL Classification Marking.

C. Exposed pipes passing through walls, floors, partitions or ceilings shall be fitted with chromium plated heavy gauge wrought brass escutcheons, fit snugly and securely held in place.

D. Pipes passing through fire rated floors shall be sealed in keeping with paragraphs A and B.

E. Sanitary vent pipes passing through roofs shall be provided with a manufactured "boot" for installation by the G.C.

F. PVC and pipe penetrations through fire rated general construction shall be firestopped with UL listed sleeve assemblies as manufactured by 3M Fire Protection Products, Nelson Firestop Products or Grace Construction Products.

G. Submit firestopping product and details for review and approval. Coordinate product with the G.C. to assure project consistency. Provide a shop drawing by the fire sealant manufacturer that clearly identifies all products and the applicable UL classification or listing.

END OF SECTION 220610
SECTION 220640
SCHEDULES FOR PLUMBING FIXTURES

PART 1 - GENERAL

1.1 FIXTURES

A. Plumbing fixtures shall be as scheduled on the drawings.

END OF SECTION 220640
PART 1 - GENERAL

1.1 REQUIREMENTS

A. Provide all insulating materials required for piping, mechanical equipment and sheet metal work. The execution of the work shall be by an experienced Insulation Contractor in strict accordance with the best practice of the trade and the intent of the specifications.

B. Insulation thermal properties and thickness shall comply with the INTERNATIONAL ENERGY CONSERVATION CODE 2009 - CHAPTER 5.

PART 2 - PRODUCT

2.1 MATERIAL

A. Insulation shall be as manufactured by Owens-Corning Fiberglass Corp., Knauf, Johns-Manville Co., or approved equal.

B. Insulating materials, jackets, adhesives, accessories and applications shall develop a system having a UL rating with a flame spread of not over 25, a fuel contributed rating of not over 50 and a smoke developed rating of not over 50.

C. Domestic Hot and Cold Water and Hot Water Recirculation piping: Cover with molded, heavy density fiberglass pipe insulation with ASJ/SSL. Adhere and seal end joint strips and overlap seams with proper mastic to provide continuous vapor barrier jacket. All fittings shall be insulated with precut fiberglass formed fittings with premolded PVC jacket mechanically fastened.

<table>
<thead>
<tr>
<th>Service</th>
<th>Pipe Size</th>
<th>Insulation Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW, HW &amp; RHW</td>
<td>All</td>
<td>1”</td>
</tr>
</tbody>
</table>

D. Insulate concealed horizontal roof drains and drain sumps with 1½” thick fiberglass flexible blanket with FSK vapor barrier facing. Insulate all exposed horizontal and vertical roof drainage with ½” thick heavy density fiberglass with ASJ/SSL.

END OF SECTION 220700
PART 1 - GENERAL

1.1 COMMISSIONING OF SYSTEM(S)

A. The Plumbing Contractor shall be responsible for self-commissioning the installed Plumbing system(s) and demonstrating proper operation and functions at conclusion of the contract.

1.2 WATER SYSTEMS STERILIZATION

A. Chlorination Method:
   1. Fill the system or any part thereof with a water solution containing 50 parts per million (ppm) available chlorine and let it stand for 24 hours before flushing and returning to service.
   2. During the chlorination process, all valves and accessories shall be operated.
   3. After chlorination, the water shall be flushed from the line at its ends until the replacement water when tested shall be found equal chemically and bacteriologically to tests of the permanent source of supply. Submit to the Owner’s representative written verification that all procedures and tests, here specified, have been performed and that water at the building outlets on test will be found identical to the source water.
   4. Chlorination treatment shall not be performed where isolation from the existing domestic water piping system is not possible. In said case, thorough flushing shall be done.

1.3 PRESSURE TESTS

A. All piping shall be pressure tested before being covered or concealed. This contractor shall provide all equipment necessary for said test. All tests shall be recorded on a log sheet noting piping section being tested, initial and final pressures, duration of test and date of test.

B. All tests shall be made in the presence of and to the satisfaction of the Owner's representative. Provide a copy of all test log sheets to the Owner’s representative upon completion of testing.

C. The piping systems may be tested in sections as the work progresses, but no joint or portion of the system shall be left untested.

D. All elements within the system that may be damaged by the testing operation shall be removed or otherwise protected during the operation.

E. All defects and leaks observed during the tests shall be corrected and made tight in an approved manner and the tests repeated until the system is proven tight.
F. Repair all damage done to existing or adjacent work or materials due to or on account of the tests.

G. All pressure piping shall be tested hydrostatically at a pressure of at least 1½ times the maximum operating pressure, but not less than 80 psi, for a two (2) hour duration with no drop in pressure.

H. Soil, waste and vent and roof drainage systems shall be tested by filling systems with water from lowest point to highest point. Water shall be allowed to stand for four (4) hours during which time there shall be no loss or leakage.

I. Natural gas piping shall be air tested at a pressure of not less than 5 psi for a two (2) hour duration with no drop in pressure.

END OF SECTION 220800
SECTION 22 11 13
FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for combined water service and fire-service mains.

B. Utility-furnished products include water meters shall be coordinated with the City of Manchester Water Works.

1.02 STANDARD REFERENCE

A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans shall govern over technical specifications.

B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".

C. City of Manchester, Water Works construction standards, latest revision.

D. New Hampshire Department of Environmental Services, Water Engineering Bureau design standards, latest revision.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Obtain approval of Manchester Water Works for all materials furnished.

B. Shop Drawings: All water distribution related components.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of the City of Manchester Water Works. Include tapping of water mains and backflow prevention.

2. Comply with standards of all authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of all authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.


D. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

1.05 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Architect and Owner no fewer than two days in advance of proposed interruption of service.

2. Do not proceed with interruption of water-distribution service without Owner's written permission.

1.06 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.


B. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

2. Gaskets: AWWA C111, rubber.

2.02 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings:

1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.


2.03 GATE VALVES

A. AWWA, Cast-Iron Gate Valves acceptable to the City of Manchester Water Works.

2.04 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies acceptable to the City of Manchester Water Works.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches (125 mm) in diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

2.05 CORPORATION VALVES AND CURB VALVES

A. Manufacturers acceptable to the City of Manchester Water Works.

B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.

1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.

2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.

3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.
C. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

D. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches (75 mm) in diameter.

   1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.06 WATER METERS
   A. Not used.

2.07 FIRE DEPARTMENT CONNECTIONS
   A. Available Manufacturers acceptable to the City of Manchester Water Works and Manchester Fire Department.

PART 3 - EXECUTION

3.01 EARTHWORK
   A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS
   A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

   B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

   C. Do not use flanges or unions for underground piping.

   D. Underground water-service piping NPS 3/4 to NPS 3 shall be soft copper tube, ASTM B 88, Type K [ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

   E. Underground water-service piping NPS 4 and NPS 8 shall be the following:

       1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

   F. Underground Fire-Service-Main Piping NPS 4 to NPS 8 shall be the following:

       1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.
G. Underground Combined Water-Service and Fire-Service-Main Piping NPS 6 to NPS 10 shall be the following:

   1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

3.03 VALVE APPLICATIONS

A. General Application use valves acceptable to the City of Manchester Water Works.

3.04 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

C. Make connections larger than NPS 2 with tapping machine according to the following:

   1. Coordinate procedure with the City of Manchester Water Works prior to scheduling work.
   2. Install tapping sleeve and tapping valve according to MSS SP-60.
   3. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
   4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
   5. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

D. Make connections NPS 2 and smaller with drilling machine according to the following:

   1. Coordinate procedure with the City of Manchester Water Works prior to scheduling work.
   2. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
   3. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
   4. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
   5. Install corporation valves into service-saddle assemblies.
6. Install manifold for multiple taps in water main.

7. Install curb valve in water-service piping with head pointing up and with service box.

E. Comply with NFPA 24 for fire-service-main piping materials and installation.
   1. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

F. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

G. Bury piping with depth of cover over top at least 66 inches, or as otherwise required by the City of Manchester Water Works.

H. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
   1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

I. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

### 3.05 JOINT CONSTRUCTION

A. Make pipe joints according to the following:
   4. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

### 3.06 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints as required by the City of Manchester Water Works. Anchorage and restrained-joint types that may be used include the following:
   1. Concrete thrust blocks.
   2. Locking mechanical joints.

4. Bolted flanged joints.

5. Heat-fused joints.

6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:


C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.07 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

C. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.08 WATER METER INSTALLATION

A. Not used.

3.09 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install protective pipe bollards on two sides of the fire department connection. Pipe bollards are specified in Division 05 Section "Metal Fabrications."

3.010 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.

C. Connect water-distribution piping to interior domestic water and fire-suppression piping.
3.011 FIELD QUALITY CONTROL

A. Piping Tests: Coordinate with the City of Manchester water Works prior to any on-site activity to review procedures. Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours or as otherwise required by the City of Manchester Water Works.

C. Prepare reports of testing activities.

3.012 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."

3.013 CLEANING

A. Clean and disinfect water-distribution piping as required by the City of Manchester Water Works.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION
SECTION 22 13 13
FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Pipe and fittings.
   2. Nonpressure and pressure couplings.
   3. Expansion joints.
   5. Encasement for piping.

1.02 STANDARD REFERENCE

A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans shall govern over technical specifications.

B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".

C. City of Manchester, Manchester Department of Public Works construction standards, latest revision.

D. New Hampshire Department of Environmental Services, Wastewater Engineering Bureau design standards, latest revision

1.03 SUBMITTALS

A. Product Data: For expansion joints.

B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

C. Product Certificates: Certify ability to accommodate HS25 loading for piping, manholes, frames and covers.

D. Field quality-control reports.
PART 2 - PRODUCTS

2.01 PVC PIPE AND FITTINGS

A.  PVC Type PSM Sewer Piping:
   1.  Pipe:  ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
   2.  Fittings:  ASTM D 3034, PVC with bell ends.

2.02 CONCRETE

A.  General:  Cast-in-place concrete complying with ACI 318, ACI 350/350R and the following:
   1.  Cement:  ASTM C 150, Type II.

B.  Portland Cement Design Mix:  4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
   2.  Reinforcing Bars:  ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C.  Manhole Channels and Benches:  Factory or field formed from concrete.  Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.  Include channels and benches in manholes.
   1.  Channels:  Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter.  Form curved channels with smooth, uniform radius and slope.
      a.  Invert Slope:  1 percent through manhole.
   2.  Benches:  Concrete, sloped to drain into channel.
      a.  Slope:  4 percent.

D.  Ballast and Pipe Supports:  Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.03 BRICK

A. General: Option for frame adjustment, invert and shelf construction shall comply with the following:

1. Brick Type: ASTM C32-05, Clay or Shale, Grade SS Hard Brick.

2. Channels and benches shall meet same requirements as concrete in above section.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.02 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of micro tunneling.

F. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 2 percent unless otherwise indicated.

2. Install piping with 72-inch (1830-mm) minimum cover.

3. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.
3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.

2. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

B. Pipe couplings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
   a. Unshielded flexible couplings for pipes of same or slightly different OD.
   b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
   c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.04 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.05 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 22 Section "Sanitary Waste and Vent Piping."

B. Make connections to existing piping and underground manholes as shown on Contract Drawings.

1. Use commercially manufactured wye fittings for piping branch connections.

2. Core hole into existing manhole, make connection with new sewer main, and construct channel.

3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.06 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
1. Use warning tape or detectable warning tape over ferrous piping.

2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.07 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.

2. Defects requiring correction include the following:
   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
   c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.

2. Test completed piping systems according to requirements of authorities having jurisdiction.

3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.

4. Submit separate report for each test.
   a. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction.

5. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction.
C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.08 CLEANING

A. Clean dirt and superfluous material from interior of piping.

END OF SECTION
PART 1 - GENERAL

1.1 SCOPE

A. All fixtures shall be free from imperfections, true to line, angles, curves and color, smooth, water tight, and complete in every respect.

B. Fixtures shall be as indicated in the schedule on the drawings. Fixtures are given as a typical standard and they, or their equal shall be furnished, set and connected in a neat and workmanlike manner.
   1. All fixtures shall be set, connected and tested.
   2. Make all water, waste, vent soil and other service connections to fixtures as indicated.
   3. Set, furnish, connect and test all necessary fittings.

C. Thoroughly clean all fixtures prior to final acceptance. All plated or polished fittings, pipes and appliances shall be coated with petroleum jelly immediately after installation and shall be highly polished and free from all marks and foreign substances as directed by the Architect.

D. All fittings, escutcheons, faucets, traps, exposed piping and the like shall be brass, chrome plated over nickel plate with polished finish.

E. All hanger visible nuts shall likewise be chrome plated over nickel plate.

F. Fixtures shall be as scheduled on the plumbing drawings. Fixtures as manufactured by Intersan, Guardian, Fiat or Zurn will be considered.

G. Fixture color shall be as selected by Architect.

END OF SECTION 224000
PART 1 - GENERAL

1.1 SECTION INCLUDES

   A. Description of HVAC system(s), quality expectations, materials and general requirements.

1.2 HVAC DEMOLITION

   A. This trade shall remove all existing piping, equipment and other mechanical specialties noted on the drawings and/or required to achieve the intent of this contract. No unused equipment, piping, ductwork or controls shall be abandoned in place. All removed equipment shall be hauled away from the site and disposed of properly, except where noted to be reused or directed otherwise in the field. Manchester Community College reserves the right of first refusal on all removed equipment and specialties.

   B. Coordinate the limits of demolition work to be performed by this trade with the General Contractor (G.C.), as certain removals will be performed by the Demolition Trade.

   C. The Contractor may not engage in the sale of any salvaged mechanical equipment, piping, materials or specialties on Manchester Community College property.

   D. This Contractor is required to coordinate all shutdowns through the General Contractor and must maintain system continuity and operation during occupied hours.

1.3 SYSTEM(S) DESCRIPTION

   A. HVAC systems of this contract shall include:
      1. Hot water heating system.
      2. Air conditioning systems.
      3. Hot water specialties.
      4. Hot water terminals as specified and/or indicated.
      5. Thermal insulation for all systems.
      6. Testing and adjusting of all systems.
      7. General Conditions of the contract.
      8. Ventilation systems.
      9. Control systems and specialties.
      10. Secure all required permits.

1.4 RELATED DIVISIONS and SECTIONS

   A. DIVISION 00 - Procurement and Contracting Requirements
   B. DIVISION 01 - General Requirements
   C. DIVISION 02 - Existing Conditions
D. DIVISION 07 - Thermal and Moisture Protection

E. DIVISION 21 - Fire Suppression

F. DIVISION 22 - Plumbing

G. DIVISION 25 - Integrated Automation

H. DIVISION 26 - Electrical

1.5 REFERENCES

A. 2009 International Building Code


C. New Hampshire State Fire Code

D. 2009 NFPA 1, National Fire Code, as adopted and amended by NH State Fire Code

E. 2009 International Plumbing Code with NH amendments

F. 2009 International Mechanical Code

G. 2009 International Energy Conservation Code

H. 2008 NFPA 70, National Electric Code

I. City of Manchester, New Hampshire ordinances, rules and regulations

J. Manchester Fire Department rules and regulations

K. All applicable ASTM Standards

1.6 SUBMITTALS

A. See SECTION 01 30 00 - Administrative Requirements, for submittal procedures.

END OF SECTION 230000
PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. All work of this Division is specifically subject to DIVISION 1 - GENERAL REQUIREMENTS for the entire project, plus General Contractor (G.C.) stipulations.

B. Provide all items, articles, materials, operations, or methods listed, mentioned, scheduled on the drawings and/or specified herein including all labor, materials, equipment and incidentals necessary and required for completion of this contract.

1.2 INTENT

A. The intent of the specifications and drawings is to call for finish work, tested and ready for operation.

B. Any apparatus, appliance, material or service not specified or indicated, but necessary to make the work complete and perfect in all respects and ready for operation shall be provided.

C. The drawings are generally diagrammatic, intended to convey the scope of work and indicate the general arrangement of equipment and piping, plus approximate size and locations of equipment.

1.3 WORKMANSHIP

A. All work shall be executed in the best and most thorough manner under the direction of, and to the satisfaction of, the Owner’s representative.

B. This contractor shall, at all times, keep a competent foreman in charge of the work and shall facilitate inspection of installations by the Owner’s representative.

1.4 RULES, REGULATIONS, PERMITS AND FEES

A. All work shall comply with applicable portions of all state or local laws, ordinances, rules and regulations of local utility companies and fire departments, NFPA, all of the International Codes 2009, National Electric Code (N.E.C.), ADA with State of NH amendments and all other AHJ.

B. Nothing contained in these specifications or indicated on the drawings shall be construed to conflict with applicable portions of any laws, ordinances, rules and regulations.

1. All pressure vessels shall be furnished and installed in strict accordance with the applicable regulations of the state and the ASME codes and shall be equipped with all appurtenances required by the aforesaid codes.
C. All required permits and fees relative to this Division shall be obtained and paid for by this contractor.

1.5 OPERATING AND MAINTENANCE MANUAL

A. In accordance with DIVISION 01 - GENERAL REQUIREMENTS, manufacturer’s printed operating and maintenance instructions for each piece of equipment furnished under DIVISION 23.

B. Each manual shall be suitably and neatly marked to identify the particular equipment furnished and shall include lubricating charts.

C. All instructions and charts shall be bound in appropriate cover binders properly indexed, identified, and titled to provide three (3) complete manuals.

D. Completed manuals shall be submitted for review. After approval, the manuals shall become property of the Owner.

1.6 OWNER INSTRUCTION

A. This contractor and suppliers, if necessary, shall thoroughly instruct the Owner’s representative and maintenance personnel in the proper maintenance and operation of materials and systems installed under this Division, as follows:

1. Detailed written instructions shall be provided for all mechanical systems, including but not limited to:
   a. Winter shut-down, spring start-up of systems, if applicable.
   b. Heating fuel conversion, if applicable.
   c. All other operations that, if improperly performed, might endanger the building’s occupants or damage the building’s equipment or contents.

2. Sessions shall be held at the completed facility to instruct the Owner in the proper operation, cleaning, lubricating and maintenance of all mechanical systems, as well as water systems chemical treatment.

END OF SECTION 230100
PART 1 - GENERAL

1.1 INTENT

A. Furnish all labor and materials to complete the installation of the HVAC systems as shown on the drawings, specified herein, or both as follows:
   1. Hot water heating system.
   2. Air conditioning systems.
   3. Hot water specialties.
   4. Hot water terminals as specified and/or indicated.
   5. Thermal insulation for all systems.
   6. Testing and adjusting of all systems.
   7. General Conditions of the contract.
   8. Ventilation systems.
   9. Control systems and specialties.
  10. Secure all required permits.
SECTION 230516
EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SCOPE

A. Expansion compensators shall be as manufactured by NAI, Keflex, Victaulic, Southeastern Hose, Inc. or Mason Industries and sized for expansion indicated or required.

B. Anchors shall be designed to suit job conditions and located where indicated on drawings or directed.

C. Expansion joints, loops and anchors shall be provided as required to control expansion and allow pipes to move from anchor points to expansion points.

D. Refer to SECTIONS 230529 and 230548 for further information and requirements relative to this Section.

END OF SECTION 230516
PART 1 - GENERAL

1.1 SCOPE

A. Provide shut-off valves to isolate sections of piping, every fixture and equipment. Valves shall be located at the inlet and outlet to permit removal for repairs without interfering with the remainder of the system.

B. Do not locate valves with stems below horizontal. Provide ball, check, balancing cocks, plus air vents and other type of valves as required for complete and proper valving of the entire installation, to control flow, shut-off, prevent backflow, provide drainage and control pressure and temperatures.

C. Valves shall be as manufactured by Watts, Apollo, Nibco, Victaulic, Anvil International, Grinnell or Milwaukee Valve Co.

PART 2 - PRODUCT

2.1 MATERIAL

A. HWS&R 2” and smaller - Ball valves for flow control and/or tight shut-off shall be all bronze construction, full port brass ball with hard chrome plating, 150 swp, with blow-out-proof stem design, equal to Watts B-6080.

B. HWS&R 2½” and larger - Butterfly valves for flow control and/or tight shut-off shall be 200 psi, C.I. body, S.S. stem, equal to Watts DBF or Victaulic Vic-300.

C. Check valves 2½” and less shall be bronze horizontal swing check, 125 swp, equal to Watts B-5000. Check valves 3” and larger shall be iron body, bronze trim, 125 swp, equal to Watts F-511-IBBM.

D. Drain valves to be installed at low points in piping and as otherwise required to completely drain piping system and equipment. Drain valves shall be ball valves of size as shown or required, in no case smaller than ½” I.P.S., equal to Watts Series B-6000-CC with ¾” male thread for hose, end outlet with cap and chain.

E. Where manual balancing valves are indicated, furnish and install Tour & Andersson Model STAD or STAF or Macon Balancing Model STV manual balancing valves, tight shut-off, packed under pressure, sized and installed as recommended by the manufacturer.

F. Approved strainers shall be installed in the inlet connections to equipment and automatic control valves to protect all apparatus or any automatic character whose proper function would be interfered with by dirt on the seat or by scoring of the seat. Strainers shall be equal to Watts series 777 and 77F-D.
G. Pressure reducing valves for water shall be of anti-siphon check type with built-in strainer equal to Watts USB and N223B.

END OF SECTION 230523
PART 1 - GENERAL

1.1 SCOPE

A. Provide suitable and substantial hangers and supports for all horizontal and vertical lines as manufactured by B-Line, Allegheny Industrial, Tolco or ITT Grinnell.

B. Support copper, steel, cast iron, and PVC piping in accordance with the pipe manufacturer’s published instructions, or the schedule below, whichever is more stringent.

C. Support piping in accordance with the following schedule:

<table>
<thead>
<tr>
<th>Pipe Material</th>
<th>Max. Horizontal Spacing</th>
<th>Max. Vertical Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper tubing</td>
<td>6’</td>
<td>10’</td>
</tr>
<tr>
<td>1¼” &amp; smaller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper tubing</td>
<td>10’</td>
<td>10’</td>
</tr>
<tr>
<td>1½” &amp; larger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel pipe</td>
<td>12’</td>
<td>15’</td>
</tr>
<tr>
<td>Cast Iron</td>
<td>At joint or 10’</td>
<td>At joint</td>
</tr>
<tr>
<td>PVC</td>
<td>As recommended by pipe manufacturer.</td>
<td></td>
</tr>
</tbody>
</table>

D. Piping, ductwork and equipment shall not be hung from the work of other trades.

E. Hang and support ductwork in accordance with SMACNA standards and best trade practices.

F. For equipment mounted outside of the building, calculate forces developed by 30 psf wind loads for the attachment of supports.

G. Refer to specification section 230548 for vibration isolation and seismic restraint requirements.

PART 2 - PRODUCT

2.1 MATERIAL

A. Hangers shall be of heavy construction suitable for the size of pipe to be supported. All materials, except pipe rollers, shall be wrought or malleable iron or steel. Hangers shall be adjustable type.
B. Hangers and pipe clamps used on copper piping shall be solid copper or copper plated. Where tube is in contact with dissimilar metal, protect with shield or plastic cover.

C. The intention is to provide supports which in each case shall be amply strong and rigid for the load, but which shall not weaken or unduly stress the building construction.

D. Hangers for pipes up to and including 4” shall be swivel ring, split ring, wrought pipe clamp, band, or adjustable wrought clevis type.

E. Hangers for pipes above 4” shall be standard clevis or roller.

F. Corrosion protection for vibration isolators for outdoor applications shall be as follows:
   1. Hardware shall be cadmium or zinc plated, all other metal parts shall be hot dipped galvanized or zinc electroplated.
   2. All hangers shall be capable of withstanding three times the rated load without failure.

G. Furnish and install shields and blocks to protect insulation and maintain thickness integrity at hanger rest points.

H. For piping \( \geq 3” \) provide Teflon slide type supports MSS (Manufacturer’s Standardization Society) Type 35 or protective saddles MSS Type 39. For insulated piping, fill interior voids of saddles with segments of insulation to match adjoining pipe insulation.

I. For all insulated piping provide protective insulation shields MSS (Manufacturer’s Standardization Society) Type 40 as follows:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Length</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \frac{1}{4}” ) to ( 3\frac{1}{2}” )</td>
<td>12”</td>
<td>18 ga.</td>
</tr>
<tr>
<td>4”</td>
<td>12”</td>
<td>16 ga.</td>
</tr>
</tbody>
</table>

END OF SECTION 230529
PART 1 - GENERAL

1.1 GENERAL

A. Scope:
   1. All mechanical piping, ductwork and equipment shall be constructed and installed
to resist seismic forces per the International Building Code 2009, or AHJ adopted
edition. Seismic analysis, engineering and submission of a shop drawing package
certified by a duly registered Professional Engineer for review by Owner’s
representatives shall be the responsibility of this contractor. Review and approval
of seismic restraint installations during the course of construction shall also be the
direct responsibility of said engineer.

B. General:
   1. This Section addresses vibration isolation and seismic control for equipment listed
hereinafter.

C. Intent:
   1. It is the intent of the seismic restraint portion of this specification to provide
restraint of non-structural building components. Restraint systems are intended to
withstand the stipulated seismic accelerations applied through the component’s
center of gravity.
   2. Each and every support attachment to the structure for equipment that falls under
the criteria of this specification must be positive, including equipment exempted
from auxiliary seismic bracing as determined by the Seismic Engineer.

D. The work in this section includes the following:
   1. Vibration isolation elements for equipment.
   2. Equipment isolation bases.
   3. Piping flexible connectors.
   4. Seismic restraints for isolated equipment.
   5. Seismic restraints for non-isolated equipment.
   6. Certification of seismic restraint designs and installation supervision.
   7. Equipment support stands, curbs, bases or rails.

E. Seismic Evaluation:
   1. Refer to the Structural Drawings for seismic design information.
   2. IBC Seismic Criteria
      a. Design Category: C
      b. Occupancy Category: II
      c. Site Class: D
      d. SDs: 0.351g
      e. SD1: 0.127g
F. Definitions:
1. The term EQUIPMENT will be used throughout this specification and to address
all non-structural components within the facility and/or serving this facility, such
as equipment located in outbuildings or outside of the main structure on grade.
Equipment buried underground is excluded, but entry of services through the
foundation walls are included. Equipment referred to below is a partial list of
equipment for reference. (Equipment not listed remains subject to this
specification.)

<table>
<thead>
<tr>
<th>AC Units</th>
<th>Comp. Rm. Units</th>
<th>Fans (All types)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Handling Units</td>
<td>Condensing Units</td>
<td>Piping</td>
</tr>
<tr>
<td>Compressors</td>
<td>Ductwork</td>
<td>Unit Heaters</td>
</tr>
</tbody>
</table>

2. Life Safety Systems defined:
   a. All systems involved with fire protection, including fire dampers and smoke
      exhaust systems.
   b. Fresh air relief systems on emergency control sequence, including air
      handlers, duct, dampers and the like.

3. Positive Attachment:
   a. Positive attachment is defined as a support location with a cast-in or wedge
      type expansion anchor, a double-sided beam clamp loaded perpendicular to a
      beam, or a welded or through bolted connection to the structure.

4. Transverse Bracing:
   a. Restraint(s) shall be applied to limit motion perpendicular or angular to the
      centerline of all applicable pipes or ducts.

5. Longitudinal Bracing:
   a. Restraint(s) shall be applied to limit motion along the centerline of all
      applicable pipes or ducts.

1.2 OEM EQUIPMENT ISOLATION PACKAGES

A. Internal and/or External Systems:
   1. Substitution of internally or externally isolated and restrained equipment in lieu of
      the isolation and restraints specified in this section is acceptable provided all
      conditions of this section are met. The equipment manufacturer shall provide a
      letter of guarantee from their Engineering Department stamped and certified per
      the section on Seismic Restraints and Analysis stating that the seismic restraints
      are in full compliance with these specifications. Letters from field offices or
      representatives are not acceptable.
   2. All costs for converting to the specified vibration isolation and/or restraints shall
      be borne by the equipment manufacturer in the event of non-compliance with the
      proceeding.
   3. In the event that the equipment is internally isolated and restrained, the entire unit
      assembly must be seismically attached to the structure. This attachment and
      certification thereof shall be by this section.

1.3 SUBMITTAL DATA REQUIREMENTS

A. Submittals:
   1. Catalog cuts or data sheets shall be submitted for review on specific vibration
      isolators and restraints to be utilized detailing compliance with the specification.
Reference “TYPE” as per “PRODUCTS” section of this specification.

2. An itemized list shall be submitted for review of all isolated and non-isolated equipment including detailed schedules showing isolator and seismic restraints proposed for each piece of equipment, referencing material and seismic calculation drawing numbers.

B. Shop Drawings:
1. Submit shop drawings that indicate base construction for equipment, including dimensions, structural member sizes and support point locations.
2. When walls and slabs are used as seismic restraint locations, details of acceptable methods for ducts and pipe must be included in the submission.
3. Shop drawings shall indicate isolation devices selected with complete dimensional and deflection data before condition is accepted for installation.
4. Shop drawings shall provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.
5. Coordinated or contract drawings shall be marked-up with the specific locations and types of restraints shown for all pipe and duct. Rod bracing requirements and assigned load at each restraint location shall be clearly delineated. Any and all tributary loads shall be considered for proper restraint sizing.
6. Shop drawings shall address ceiling suspended equipment design restraints for a minimum installation angle of 30° from vertical. Shop drawings shall indicate maximum installation angle allowed for restraint system as well as braced and unbraced rod lengths at each allowable installation condition.
7. Shop drawings shall calculate thrust for fan heads, axial and centrifugal fans to determine whether thrust restraints are required.

C. Seismic Certification and Analysis:
1. Seismic restraint calculations must be provided for all connections of equipment to the structure. Performance of products, such as strut, cable, anchors, clips, etc., associated with restraints must be explained and supported with manufacturer’s data sheets or certified calculations.
2. For roof mounted equipment both, the seismic acceleration and wind loads (30 psf) shall be calculated, with the highest load utilized for the design of the restraints and isolators.
3. Certification of calculations to support seismic restraint designs must be stamped by a Professional Engineer registered in the State were the project is located.
   a. Analysis must indicate calculated dead loads, derived loads and materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and weld length.
4. An in force Errors and Omissions insurance certificate must accompany submittals. Manufacturer’s product liability insurance certificates are not acceptable.

1.4 MANUFACTURER’S RESPONSIBILITY

A. Manufacturer of vibration and seismic control equipment shall have the following responsibilities:
1. Determine vibration isolation and seismic restraint sizes and locations.
2. Provide equipment vibration isolation and seismic restraints as specified.
4. Provide installation instructions, drawings and field supervision to insure proper installation and performance of systems.

1.5 RELATED WORK

A. Attachments:
   1. This contractor shall provide restraint attachment plates cast into housekeeping pads, concrete inserts, double sided beam clamps, etc., in accordance with specifications of the Seismic Engineer.

1.6 CODE REQUIREMENTS

A. Seismic restraints as described herein shall be provided in accordance with the International Building Code 2009, or AHJ adopted edition.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. Devices:
   1. All vibration isolation and seismic devices described in this section shall be the product of a single supplier. Novia Associates, Inc. (NAI) is the preferred supplier. Equivalent products manufactured by MCS will be considered provided their systems comply with intent, structural design, performance and deflections of these specifications.

2.2 SEISMIC RESTRAINTS AND VIBRATION ISOLATION TYPES

A. General:
   1. All isolation and seismic restraint devices shall be capable of accepting, without failure, the “G” forces as determined by the seismic certification and calculations as described in the “SUBMITTAL DATA REQUIREMENTS” section of these specifications.
   2. Corrosion protection for outdoor applications shall be as follows:
      a. Springs shall be cadmium plated, zinc electroplated or powder coated.
      b. Hardware shall be cadmium or zinc plated.
      c. All other metal parts shall be hot spray or hot dipped galvanized or zinc electroplated.
   3. All seismic restraint devices:
      a. Shall maintain the equipment in a captive position and not short circuit isolation device during normal operating conditions.
      b. Shall have provisions for bolting and/or welding to the structure.
   4. Welding of springs to isolator housing, base plates, etc. is strictly prohibited.

B. Seismic Restraint Types:
   1. TYPE III: Restraints for suspended systems.
      a. Vibration isolated systems shall be braced with multiple 7 x 19 galvanized steel cables with approved attachment devices (such as thimbles and wire rope clips) to equipment and structure.
b. Non-isolated systems shall be braced with structural steel strut or cable with approved attachment devices to equipment and structure.

c. Steel angles (by contractor) shall be provided to prevent rod bending of hung equipment where indicated by the Seismic Restraint Supplier’s submittals. Steel angles shall be attached to the rods with a minimum of three clamps model “SRC” at each restraint location. Welding of support rods to angles is not acceptable.

C. Vibration Isolator Types:

1. TYPE A: Spring Isolator - Free Standing.
   a. Spring shall have a minimum outer diameter to overall height ratio of 0.8:1 at rated deflection.
   b. Reserve deflection (from published load ratings to solid height) of 50% of the rated deflection.
   c. Minimum ¼” thick neoprene acoustical base pad or cup on underside, unless designated otherwise.
      • Model “SM” as manufactured by NAI.

2. TYPE B: Spring Isolator - Restrained.
   a. Shall be the same as TYPE A with the following additional features.
      1) Integral restraining bolts with elastomeric cushions preventing metal-to-metal contact.
      2) Internal spring adjusting nut or bolt.
      3) Built-in all-directional limit stops with minimum ⅛” clearance under normal operation.
         • Model “RSM” as manufactured by NAI.

3. TYPE C: Spring Hanger Isolator.
   a. Spring element (same as TYPE A) within a steel box with an Elastomer bushing to insulate lower support rod from the hanger box.
   b. Steel hanger box shall be capable of 30° misalignment between the rod attachment to structure and the connection to the supported equipment. Hanger boxes shall withstand three times the rated load without failure.
      • Model “SH” as manufactured by NAI.

4. TYPE D: Double deflection neoprene.
   a. Mountings shall be fabricated to resist the wind or seismic forces.
      • Model “RNM” as manufactured by NAI.

5. TYPE E: Elastomer Hanger Isolator.
   a. Molded neoprene element with a bushing to insulate lower support rod from the hanger box.
   b. Steel hanger box shall withstand three times the rated load without failure.
      • Model “NH” as manufactured by NAI.

6. TYPE F: Combination Spring/Elastomer Hanger Isolator.
   a. Spring and neoprene elements in a steel hanger box with the features as described for TYPE C and E isolators.
      • Model “SNH” as manufactured by NAI.

7. TYPE G: Pad type elastomer isolator.
   a. Neoprene pad shall have 0.50” minimum thickness, deflection rating of 0.1 inch under rated load.
   b. 1/16” galvanized steel plate between multiple pad layers.
   c. Load distribution plate where attachment to equipment bearing surface is less than 75% of the pad area.
d. When bolting is required for seismic compliance, neoprene and duck washers and bushings shall be provided to prevent short-circuiting of bolt.
   ▪ Model “NP” as manufactured by NAI.

8. TYPE H: Pad type elastomer isolator.
   a. Laminated canvas duck and neoprene, maximum loading 1000 psi, minimum ½” thick.
   b. Load distribution plate where attachment to equipment bearing surface is less than 75% of the pad area.
   c. When bolting is required for seismic compliance, neoprene and duck washers and bushings shall be provided to prevent short-circuiting.
      ▪ Model “LNP” as manufactured by NAI.

9. TYPE I: Thrust Restraints.
   a. A spring element same as TYPE A shall be combined with steel angles, backup plates, threaded rod, washers and nuts to produce a pair of devices capable of limiting thrust movement of air moving equipment to ¼”.
   b. Restraints shall be easily converted in the field from a compression type to tension type.
   c. Unit shall be factory precompressed.
      ▪ Model “TR” as manufactured by NAI.

    a. Telescoping arrangement of two sizes of steel tubing separated by a minimum ½” thickness of TYPE H pad.
       ▪ Model “TRG” as manufactured by NAI.

11. TYPE K: Resilient Pipe Anchors and Guides.
    a. All directional acoustical pipe anchor, consisting of a telescopic arrangement of two sizes of steel tubing separated by a minimum ½” thickness of TYPE H pad.
    b. Vertical restraint shall be provided by a similar material arranged to prevent vertical travel in either direction.
    c. Allowable loads on neoprene pad shall not exceed 500 PSI and the design shall be balanced for equal resistance in any direction.
       ▪ Model “RAG” as manufactured by NAI.

    a. For roof mounted equipment that can be point supported, isolators shall attach directly to the structure with 1”, 2” or 3” deflection springs.
    b. For equipment set on wood sleepers, the sleepers shall be bolted to the structure, penetrating the roof membrane.
    c. This isolator shall have all features of the TYPE B isolator.
    d. Shall have galvanized steel spring pocket covers for adjustment and/or removal and replacement of springs.
    e. The combination floating top rail and top flashing shall be fabricated of two formed and nested layers of 12 ga. galvanized steel.
    f. Isolator shall be flashed directly into the waterproofing membrane.
    g. To be complete with wood nailers, plywood sides, counter flashing and resilient weather seal.
       ▪ Model “FRSM” as manufactured by NAI.

13. TYPE P: Elastomer Isolator.
    a. Double deflection neoprene compression mountings.
    b. Non-skid top and bottom surfaces.
    c. Threaded bolting sleeves shall be embedded in the isolator.
d. Drilled tie-down bolt holes shall be provided in the base plate.
   - Model “FMD” by NAI.

PART 3 - EXECUTION

3.1 GENERAL

A. Isolation and seismic restraint systems must be installed in strict accordance with the manufacturer’s submittal data.

B. Vibration isolators shall not cause any change of position of equipment resulting in stress on equipment connections.

3.2 PIPING AND DUCTWORK ISOLATION

A. Installation:
   1. General.
      a. Hanger isolators shall be installed with the hanger box hung as close as possible to the structure (without touching).
      b. Hanger rods shall not short-circuit the hanger box.
   2. All piping in mechanical equipment room(s) attached to rotating or reciprocating equipment shall be isolated as follows:
      a. Water and steam piping.
         1) Water piping 1¼” to 2” and all steam piping larger than 1” shall be hung with TYPE E isolators with 0.25” deflection.
         2) Water pipe larger than 2” shall be hung with TYPE F isolators with 0.75” deflection.
         3) Horizontal floor or roof mounted water piping 1¼” to 2” and all steam piping larger than 1” shall be supported by TYPE P isolators with 0.3” deflection.
         4) Water pipe larger than 2” shall be supported by TYPE B isolators with 0.75” deflection.
      b. Control air piping and vacuum piping from compressor discharge to receiver shall be suspended by TYPE E isolators with 0.25” deflection or supported by TYPE P isolators with 0.3” deflection.
   3. All ductwork over four square feet face area located within 50’ from air moving equipment shall be hung with TYPE C hangers with 0.75” deflection.
   4. Emergency generator exhaust shall be isolated with TYPE C isolators with 0.75” deflection (all neoprene components shall be omitted).
   5. Vertical riser supports for water and steam pipe 4” diameter and larger shall be isolated from the structure using TYPE K guides and anchors.

3.3 SEISMIC RESTRAINTS

A. Installation:
   1. All floor mounted equipment whether isolated or not shall be snubbed, anchored, bolted or welded to the structure. Calculations that determine that isolated equipment movement may be less than the operating clearance of snubbers (restraints) do not preclude the need for snubbers. All equipment must be positively attached to the structure.
2. All suspended equipment including, but not limited to; air handling units, pumps, fans, tanks, unit heaters, etc. shall be two or four point independently braced with TYPE III restraints. Install cable braces taught for non-isolated equipment and slack with ½” cable deflection for isolated equipment. Rod bracing shall be installed as per approved submittals and shop drawings. Equipment connected to ductwork weighing less than 75 lbs. is excluded.

3. All horizontally suspended pipe and duct shall use RESTRAINT TYPE III. Spacing of seismic bracing shall be as per TABLE B at the end of this Section.

4. For all trapeze-supported piping, the individual pipes must be attached to the trapeze support at the designated restraint locations.

5. For overhead supported equipment, over stress of the building structure must not occur. Bracing may occur from:
   a. Flanges of structural beams.
   b. Upper truss chords in bar joists.
   c. Cast in place inserts or drilled and shielded inserts in concrete structures.

6. Pipe Risers:
   a. Where pipe pass through cored holes, holes must be packed with resilient material or fire stop as specified in other sections of this specification and/or state and local codes. No additional horizontal seismic bracing is required at these locations.
   b. Non-isolated, constant temperature pipe risers through cored holes require a riser clamp at each floor level on top of the slab attached in a seismically approved manner for vertical restraint.
   c. Non-isolated, constant temperature pipe risers in pipe shafts require structural steel attached in a seismically approved manner at each floor level and a riser clamp at each floor level on top of, and fastened to the structural steel. The riser clamp and structural steel must be capable of withstanding all thermal, static and seismic loads.
   d. Isolated and/or variable temperature risers through cored holes require Type K riser resilient Guides and Anchors installed to meet both thermal expansion and seismic acceleration criteria.
   e. Isolated and/or variable temperature risers in pipe shafts require Type K resilient riser guides and anchors installed on structural steel to meet both thermal expansion and seismic acceleration criteria. Each floor level must have a riser clamp that does not interfere with the thermal expansion/contraction of the pipe.

7. A rigid piping or duct system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. Examples: Wall and roof; solid concrete wall and a metal deck with lightweight concrete fill, pipes and duct that cross a building expansion joint.

B. Exemptions:
1. Exclusions from seismic requirements on life safety and non-life safety mechanical equipment will be determined by the Seismic Engineer based on analysis of the adopted code.
3.4 INSPECTION

A. If, in the opinion of the project engineer, the seismic restraint installation does not meet with the project requirements, an outside consultant will be retained to inspect, verify and submit corrective measures to be taken. The consultant’s fees and all work associated with such a review shall be borne by the contractor.

3.5 REFERENCE TABLE B

<table>
<thead>
<tr>
<th>TABLE B SEISMIC BRACING TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EQUIPMENT</strong></td>
</tr>
<tr>
<td>DUCT</td>
</tr>
<tr>
<td>PIPE</td>
</tr>
<tr>
<td>BOILER BREECHING</td>
</tr>
<tr>
<td>CHIMNEYS &amp; STACKS</td>
</tr>
</tbody>
</table>

3.6 TABLE B NOTES

A. Projects that contain large pipe may require that the allowable spacing shown in this Table be reduced to minimize structural loading. All associated costs shall be the responsibility of the contractor. Close coordination and approval by the structural engineer is mandatory for all seismic point loads exceeding 2,000 lbs.

END OF SECTION 230548
SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Identification shall be provided on all piping that is exposed, as well as at all concealed locations such as crawl spaces, service tunnels, shafts and above removable ceilings in which piping may be viewed.
   1. Furnish and affix approved adhesive bands identifying the service and direction of flow of the various piping systems.
   2. A set of such bands shall be affixed to each pipe not less than 30' and there shall be at least one set of identifying bands in each room where piping may be viewed.
   3. Each set shall consist of one band on which the name of the service is printed and one band on which is printed a black directional arrow.

B. Identification bands shall have adhesive backing. Submit same for approval.
   1. The name of the service shall be printed in black letters not less than 2" high for 3" pipe and larger; 1" high for pipe 2½" and smaller.
   2. Bands shall be applied where they can be read with their long dimension parallel to the axis of the pipe or duct.
   3. Bands shall be applied only after finish painting is completed.

C. Attach to each valve a 2” brass tag on which shall be stamped designating letters and numbers ½” high filled with black enamel. Letters designate service.
   1. The tags shall be securely fastened to the handle or spindle of the valve by a brass chain.
   2. Furnish four (4) schedules of valves so tagged, mounted in the Operation & Maintenance (O&M) manuals.
   3. One (1) copy of such schedules shall be mounted in glazed frames located in the Boiler Room or where directed by the Owner’s representative. Review numbering with the Owner’s representative prior to installation and honor any existing numbering systems in force today.
   4. The system of numbering for each service shall start with the No. 1 beginning at the point of main service and progress throughout the contract area.

D. Provide nameplates for all equipment, motor starters, push button stations, pilot light stations or control points, and any other points in the building deemed necessary by the Owner’s representative.
   1. Nameplates shall be fabricated from black bakelite with white recessed letters permanently secured with screws.
   2. Nameplate schedule and sample shall be submitted for approval.
   3. Coordinate identification of exhaust fan switches provided by the Electrical Contractor.

E. Provide permanent labels on all pieces of mechanical equipment designating the unit tag as it is shown on mechanical drawings.
F. As part of the Owner Instruction session, review the location of valves, circulators, dampers and other specialties concealed above ceilings. Furnish and install adhesive dots on ceiling tiles (in the corner) for access reference.

<table>
<thead>
<tr>
<th>Dot Color</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Heating and cooling</td>
</tr>
<tr>
<td>Blue</td>
<td>Domestic water</td>
</tr>
<tr>
<td>Green</td>
<td>Air-side specialty</td>
</tr>
</tbody>
</table>

PART 2 - PRODUCT

2.1 MATERIAL

A. Identification bands, tags, charts and dots shall be as manufactured by Seton or Carlton.

END OF SECTION 230553
PART 1 - GENERAL

1.1 TESTING AND BALANCING

A. Procure the service of an independent Testing and Balancing Agency that specializes in the testing and balancing of heating, ventilating and air conditioning systems.

B. Both the air and water systems shall be done by the same agency.

C. Work shall not begin until the agency has been notified in writing that all systems have been completed, cleaned and placed in full working sequence by this contractor. Clean filters shall be installed by this contractor prior to start of balancing work.

D. Test, balance and adjust all air moving equipment, terminals, supply, return and exhaust systems. Work together with the ATC Contractor to adjust setpoints of outside/return/exhaust dampers where applicable.

E. Test, balance and adjust all water systems to provide scheduled flows to all terminals and eliminate noise.

F. When all control systems and preliminary testing and balancing are complete, this contractor, with the cooperation of the ATC Contractor, shall perform an independent test of all systems for specified sequences of operation. Refer to DIVISION 25.
   1. The test shall include all operations as specified in DIVISION 25, “Sequence of Controls”.
   2. All dampers, valves, and similar appurtenances shall be visually or physically confirmed to operate as specified. Operating and safety devices such as aquastats and freezestats shall be verified operational.
   3. All interlocks between equipment shall be confirmed to operate as specified.
   4. This contractor shall provide the ATC Contractor with operating setpoints as well as alarm setpoints such as dirty filters, high/low limits, etc., as required.
   5. Report findings per J. below.

G. Perform all tests in accordance with standard procedures such as those outlined by the Associated Air Balance Council (AABC) and/or Sheet Metal and Air Conditioning Contractors National Association, Inc., (SMACNA).

H. At completion of all testing and balancing, leave all equipment systems, components, etc., adjusted within the limits of installed equipment and to within 10% of design requirements. Mark all setpoints of all dampers and valves with distinguishing marks. If requested, conduct tests in the presence of the Owner’s representative.

I. Within 15 days after completion of testing and balancing, submit for review six (6) copies of the testing and balancing results on industry recognized forms. Include a warranty period of 90 days during which time the Owner’s representative may request recheck or re-adjustment of any part of the job.
J. All reports shall clearly indicate the following minimum information:

1. **Air** - System name, rated and actual HP, BHP, motor nameplate efficiency, voltage, amperage, fan rpm, suction, discharge and total static pressures, total system flow rate, individual terminal flow rates. Terminal readings must show location, make, model and size of register, grille, or diffuser. Include a static pressure profile of all AHU’s components.

2. **Water** - Pump full flow and no-flow suction and discharge pressures, rated and actual amperage, HP, BHP, motor nameplate efficiency, voltage and total dynamic head. Calibrated balancing device readings shall indicate location, size, setting, differential pressure, and rated and actual GPM. 50% of the total automatic balancing valves installed shall be tested to verify proper function, and reported on. All air handling unit coils and any other critical equipment shall be included in the 50% tested. Review details with the project engineer prior to conducting the work.

3. **ATC Sequence Check**: Report shall include a paragraph-by-paragraph review of the sequence of controls specification, noting either “operates as specified”, or detailing any deviations or deficiencies.
   a. Should the HVAC systems be found incomplete or not performing per specification, the ATC Contractor shall correct deficiencies and the Testing and Balancing Subcontractor shall recheck until all sequences have been verified proper.

END OF SECTION 230593
PART 1 - GENERAL

1.1 MATERIALS - GENERAL

A. Steel pipe shall be lap welded or seamless with maker's name rolled on each length equal to ASTM-A-53 of weight specified.

B. Copper tube shall be seamless, hard or soft equal to ASTM-B88 of type specified.

C. PVC pipe and fittings shall meet or exceed the requirements of ASTM D-1784 and 1785.

PART 2 - PRODUCT

2.1 SCHEDULE OF HVAC RELATED PIPE MATERIALS

<table>
<thead>
<tr>
<th>Service</th>
<th>Location</th>
<th>Size</th>
<th>Material</th>
<th>Type</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWS&amp;R</td>
<td>Above</td>
<td>2&quot; &amp;</td>
<td>Steel or</td>
<td>Screwed</td>
<td>Sch. 40</td>
</tr>
<tr>
<td></td>
<td>Grade</td>
<td>Smaller</td>
<td>Hard Copper</td>
<td>Tube</td>
<td>Type L</td>
</tr>
<tr>
<td>HWS&amp;R</td>
<td>Above</td>
<td>2½&quot; &amp;</td>
<td>Steel</td>
<td>Roll</td>
<td>Sch. 10</td>
</tr>
<tr>
<td></td>
<td>Grade</td>
<td>Larger</td>
<td>Roll</td>
<td>Grooved</td>
<td></td>
</tr>
</tbody>
</table>

2.2 SCHEDULE OF HVAC RELATED PIPE FITTINGS & FLANGES

<table>
<thead>
<tr>
<th>Service</th>
<th>Location</th>
<th>Size</th>
<th>Material</th>
<th>Type</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWS&amp;R</td>
<td>Above</td>
<td>2&quot; &amp;</td>
<td>Steel or</td>
<td>Screwed</td>
<td>150#</td>
</tr>
<tr>
<td></td>
<td>Grade</td>
<td>Smaller</td>
<td>W. Copper</td>
<td>Soldered</td>
<td>Lead-free</td>
</tr>
<tr>
<td>HWS&amp;R</td>
<td>Above</td>
<td>2½&quot; &amp;</td>
<td>Steel</td>
<td>Victaulic</td>
<td>150#</td>
</tr>
<tr>
<td></td>
<td>Grade</td>
<td>Larger</td>
<td>Zero-Flex</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PART 3 - EXECUTION

3.1 INTENT

A. Furnish and install all mechanical work of this contract in accordance with governing codes and in a workmanlike manner.

B. The run and arrangement of all HVAC related pipes shall be approximately as shown on the drawings and as directed during installation and shall be as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and be neatly spaced.
C. Arrange work to avoid all interference with the work of all other trades. Consult with other contractors, and coordinate the location of their work with that of the others.

3.2 GENERAL INSTALLATION OF HVAC RELATED PIPING

A. All piping shall be properly supported or suspended on stands, clamps, hangers and the like, in accordance with sections 23 05 29 and 23 05 48.
   1. Supports shall be designed to permit free expansion and contraction while minimizing vibration.

B. Screw threads shall be cut clean and true. Bushings shall not be used.
   1. All reductions shall be made with eccentric reducers or eccentric fittings.
   2. All pipe two inch (2") or less shall be reamed after cutting to remove all burrs.

C. The drawings indicate generally the size and location of piping, and while sizes must not be decreased, the right is reserved for Owner’s representative to change runs and sizes of pipes in order to accommodate conditions on the job.
   1. Any pipes not indicated on the drawings shall be sized as directed and run where directed by the Owner’s representative.

D. Piping shall be properly graded to insure easy circulating and prevent noise and water hammer. Water piping shall pitch upward in the direction of flow, except the water piping located above finished ceilings which may be run level.
   1. Proper provision shall be made for expansion and contraction in all portions of pipe work to prevent undue strain on piping, fixtures or apparatus connected therewith.

E. Vent all high points and drain all low points in water systems as required to achieve perfect water circulation.

F. Take runouts off top of mains at 45° or 90° angle with at least one swing joint between riser or stub and main.

G. For change in horizontal piping size use eccentric reducer coupling with bottom of coupling horizontal.

3.3 HVAC RELATED PIPE JOINTS AND FITTINGS

A. Fittings for use on steel pipe shall be screwed iron or welded fittings of type and weight as scheduled. For hot water services noted in the Schedule, mechanical fittings as manufactured by Victaulic, ANVIL International or Grinnell may be used. Note that only Zero-Flex couplings shall be used with Schedule 10 steel pipe. Gaskets used in the mechanical couplings must be compatible and rated for intended service with respect to pressure and water system inhibitors or glycol.

B. Flanges on steel pipe shall be screwed cast iron or welded type of weight to match the piping on which installed. For hot water services noted in the Schedule, mechanical fittings as manufactured by Victaulic, ANVIL International or Grinnell may be used.
1. Flange gaskets shall be ring type 1/16" thick of compressed fiber and sealant suitable for service intended, factory cut for actual flange size and service pressure.

C. Dissimilar pipe materials (copper to steel, etc.) shall be joined with an approved dielectric fitting or brass coupling.

D. Flexible metal hose connectors shall be as manufactured by NAI, Southeastern Hose, Inc., Keflex, Proco Products, Inc., Victaulic or equal.

E. Furnish and install adapter fittings to mate the R-flex metric tube sizes to imperial fittings.

3.4 WELDING AND SOLDERING PIPE

A. Welded joints, outlets and flanges shall be used as shown on drawings, specified or directed. Welded joints may also be provided elsewhere at this Contractor's option except on piping smaller than 2½", or at points where it may be explicitly specified or directed to leave flanged joints in order to facilitate future changes.

B. All welded joints (except pipe welded end to end) shall be made by use of forged one-piece welding flanges caps, nozzles, elbows, branch outlets and tees, equal to WELDBEND.
   1. All such fittings shall be of a type which maintains full wall thickness at all points, ample radius and fillets, and proper bevels or shoulders at ends.
   2. Wel-o-lets or Thread-o-lets may be used where standard fittings or required sizes are not available and elsewhere approved.

C. All job welding shall be done by the electric arc welding process.
   1. All welding shall be done in accordance with the welding procedures of the National Certified Pipe Welding Bureau or other approved procedure, conforming to the requirements of the ASME Boiler and Pressure Vessel Code or the ASA Code for Pressure Piping.

D. All piping 2½" size and larger shall be butt welded with welded fittings. Stub welding shall not be permitted.

E. Fittings in copper tubing shall be wrought copper for sweat solder joints. Joints in copper water piping shall be made with solder, per schedule, and shall meet ASTM-B32-96AM. Flux shall be equal to Canfield's SOLDER-MATE and COPPER-MATE. No borax or alcohol mixtures or resin or similar paste fluxes shall be used. Care should be taken to see that no surplus flux is on the inside of the pipe when the joint is completed.

3.5 FIRE SEALANT

A. Fire sealing at all penetrations through rated general construction shall be in accordance with SECTIONS 07841 and 07920.

B. Pipes passing through all masonry and fire rated gypsum board walls shall pass through clean cut holes fitted with steel pipe sleeves, the inside diameter of which shall be at
least 1” greater than the outside of the pipe passing through it. Pipes passing through non-rated gypsum board walls do not require sleeves, but the void between wall opening and pipe must be sealed and taped. Where UL approved for the application, pipe insulation shall be continuous through sleeve/hole, and all space between pipe and sleeve/hole shall be caulked full with product per SECTIONS 07841 and 07920. Installation details shall be in accordance with the sealant manufacturer’s published instructions in order to bear the UL Classification Marking.

C. Exposed pipes passing through walls, floors, partitions or ceilings shall be fitted with chromium plated heavy gauge wrought brass escutcheons, fit snugly and securely held in place.

D. Ducts passing through rated walls shall be caulked with a minimum of 1¼” thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At the point contact location between duct and wallboard, a minimum ¼” diameter bead of caulk shall be applied at the wallboard/duct interface on both surfaces of wall assembly. Void fill material must bear the UL Classification Marking and installation details shall be in accordance with the sealant manufacturer’s published instructions in order to bear the UL Classification Marking.

E. Pipes and ducts passing through fire rated floors shall be sealed in keeping with paragraphs A, B and D.

F. PVC and CPVC pipe penetrations through fire rated general construction shall be firestopped with UL listed sleeve assemblies as manufactured by 3M Fire Protection Products, Nelson Firestop Products or Grace Construction Products.

G. Submit firestopping product and details for review and approval. Coordinate product with the G.C. to assure project consistency. Provide a shop drawing by the fire sealant manufacturer that clearly identifies all products and the applicable UL classification or listing for penetrations applicable to the project.

END OF SECTION 230620
PART 1 - GENERAL

1.1 SCOPE

A. Provide all insulating materials required for piping and mechanical equipment. The execution of the work shall be by an experienced Insulation Contractor in strict accordance with the best practice of the trade and the intent of the specifications.

B. Insulation thermal properties and thickness shall comply with the INTERNATIONAL ENERGY CONSERVATION CODE 2009 - CHAPTER 5.

PART 2 - PRODUCT

2.1 MATERIAL

A. Insulation shall be as manufactured by Owens-Corning Fiberglass Corp., Knauf, Johns-Manville Co., or approved equal.

B. Insulating materials, jackets, adhesives, accessories and applications shall develop a system having a UL rating with a flame spread of not over 25, a fuel contributed rating of not over 50 and a smoke developed rating of not over 50.

C. Hot Water Supply & Return piping: Cover with molded, heavy density fiberglass pipe insulation with ASJ/SSL. Adhere and seal end joint strips and overlap seams with proper mastic to provide continuous vapor barrier jacket. All fittings shall be insulated with precut fiberglass formed fittings with premolded PVC jacket mechanically fastened, including unions, couplings, flanges and air separators where applicable.

<table>
<thead>
<tr>
<th>Service</th>
<th>Pipe Size</th>
<th>Insulation Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWS&amp;R</td>
<td>up to 1½”</td>
<td>1½”</td>
</tr>
<tr>
<td>HWS&amp;R</td>
<td>2” &amp; larger</td>
<td>2”</td>
</tr>
</tbody>
</table>

D. Insulate exposed pipe drops to heating terminals subject to physical abuse per C. of this Section, but cover entire exposed length with protective 30 mil PVC jacket (white).

END OF SECTION 230700
SECTION 230713
DUCT INSULATION

PART 1 - GENERAL

1.1 SCOPE

A. Provide all insulating materials required for piping and mechanical equipment. The execution of the work shall be by an experienced Insulation Contractor in strict accordance with the best practice of the trade and the intent of the specifications.

B. Insulation thermal properties and thickness shall comply with the INTERNATIONAL ENERGY CONSERVATION CODE 2009 - CHAPTER 5.

PART 2 - PRODUCT

2.1 MATERIAL

A. Insulation shall be as manufactured by Owens-Corning Fiberglass Corp., Knauf, Johns-Manville Co., or approved equal.

B. Insulating materials, jackets, adhesives, accessories and applications shall develop a system having a UL rating with a flame spread of not over 25, a fuel contributed rating of not over 50 and a smoke developed rating of not over 50.

C. Insulate all fresh air intake ductwork, make-up air ductwork, relief and exhaust fan plenums, and exhaust discharge ductwork externally with 1½” foil faced (FSK) .75 PCF (R = 5.2) fiberglass insulation. Insulation shall be wrapped tightly on ductwork with all circumferential joints butted together and longitudinal joints overlapped 2”. For exposed conditions, use ASJ cover instead of FSK. Staple longitudinal joints air tight. Interior ductwork shown to be acoustically lined does not have to be wrapped.

D. Acoustic lining shall be 1” thick flexible closed cell duct liner. Lining shall meet the Life Safety Standards of NFPA 90A, NFPA No. 101 Class A Rating, UL 94-5V Flammability Classification and shall meet the requirements of ASTM E96, ASTM D1056, ASTM D1171 and UL 181 for resistance to microdial growth and air erosion. Dimensions of lined duct on the drawings are the inside dimensions of the duct after the lining has been installed. Product shall be IMCOA IMCOSHEET or K-Flex, GREENGUARD certified. As an alternative to closed cell duct liner, fibrous duct liner with reinforced coating system, GREENGUARD certified, equal to Johns Manville Linacoustic RC 1” thick, may be used. Duct lining shall be adhered to metal duct with full coverage of a fire retardant adhesive, as recommended and/or supplied by the manufacturer. Install liner and adhesive in strict accordance with the manufacturer's published instructions including proper cleaning of ductwork. Traverse joints shall be compression fit and butted without gaps. All leading edges shall be installed with metal nosings.
PART 3 - EXECUTION

3.1 INSTALLATION

A. All external insulation systems on ductwork, breechings and the like shall be applied in strict accordance with the insulation manufacturer’s published instructions.

END OF SECTION 230713
PART 1 - GENERAL

1.1 COMMISSIONING OF SYSTEM(S)

A. The Mechanical Contractor shall be responsible for self-commissioning the installed HVAC system(s) and demonstrating proper operation and functions at conclusion of the contract.

1.2 PRESSURE TESTS

A. All piping shall be pressure tested before being covered or concealed. This contractor shall provide all equipment necessary for said test. All tests shall be recorded on a log sheet, noting piping section tested, initial and final pressures, duration of test and date of test.

B. All tests shall be made in the presence of and to the satisfaction of the Owner's representative. Provide a copy of all test log sheets to the Owner’s representative upon completion of testing.

C. The piping systems may be tested in sections as the work progresses, but no joint or portion of the system shall be left untested.

D. All elements within the system that may be damaged by the testing operation shall be removed or otherwise protected during the operation.

E. All defects and leaks observed during the tests shall be corrected and made tight in an approved manner and the tests repeated until the system is proven tight.

F. Repair all damage done to existing or adjacent work or materials due to or on account of the tests.

G. All pressure piping shall be tested hydrostatically at a pressure of at least 1½ times the maximum operating pressure, but not less than 80 psi, for a two (2) hour duration with no drop in pressure.

1.3 SYSTEMS FLUSHING

A. For the hot water system, extreme caution shall be exercised by contractor to prevent dirt and other foreign matter from entering pipes or components of system during construction. Pipe stored on project shall have open ends capped and equipment shall have all openings fully protected. Before erection, each piece of pipe, fitting or valve shall be visually examined and all dirt removed.

B. With the system filled with clean water, circulation established and trapped air vented, the boiler and chiller plants shall be energized. Any leaks in piping shall be repaired before proceeding with further test procedures. Low point drains in the system shall be opened for initial flush and blowdown, with city water fill valves set to make up water at
an equal rate. Check pressure gauge at pump suction and manually adjust make-up water to maintain steady positive pressure before and after opening drain valves. Flushing shall continue until clean water is evident leaving open drains. In no case shall the flushing period be less than two hours. Upon completion of flushing, all strainers shall be removed, cleaned and reinstalled.

C. After initial system flushing, chemically clean the hot water piping system in accordance with best trade practices and recommendations offered by the Owner’s water treatment contractor.

D. After said cleaning procedure, the systems shall then be drained completely and refilled with fresh water.

E. After systems have been completely cleaned, they shall be tested by an independent agency and left on the slightly alkaline side (pH 7.5). If systems are still on the acid side, cleaning by use of trisodium phosphate shall be repeated. Submit certified test results to the Owner’s representative for record.

F. Inhibitors shall be introduced to the hot water piping system as specified hereinafter and/or as directed by the Owner’s water treatment contractor.

1.4 AUTOMATIC TEMPERATURE CONTROLS (ATC) SEQUENCE CHECK

A. This contractor shall be responsible for the scheduling and coordination of subcontractors, specifically the Testing and Balancing Subcontractor and ATC Subcontractor, for the performance of an ATC sequence check on all HVAC systems described in DIVISION 25, “Sequences of Operation”.

1. ATC installation and preliminary testing and balancing shall be complete prior to the scheduling of the ATC sequence check.

B. This contractor shall notify the engineer 48 hours prior to the scheduled performance of the ATC sequence check.

END OF SECTION 230800
PART 1 - GENERAL

1.1 AUTOMATIC TEMPERATURE CONTROL

   A. Refer to DIVISION 25 for Automatic Temperature Control work.

END OF SECTION 230900
PART 1 - GENERAL

1.1 VARIABLE FREQUENCY DRIVES

A. This contractor, as part of the Trane equipment package, or equal, shall provide factory furnished and installed variable frequency drives (VFD) to control the supply fan and return fans physically located within the air handling units scheduled on the drawings. VFD’s shall be housed in the unit and prewired from the manufacturer, not shipped loose for installation in the field. In addition, this contractor shall furnish VFD’s for controlling hot water pumps P-1 and P-2 and install where shown on plans. VFD manufacturer shall be Danfoss, ABB, Square D, Yaskawa, G.E., Cutler-Hammer or Cerus. In all cases, VFD’s shall be furnished with input and output power disconnects.

1. VFD’s provided shall be appropriate for interface with the control manufacturer secured under DIVISION 25.

B. As a minimum, all VFD’s shall have the following design standards and safety features:

1. VFD shall be housed in an all-steel hinged NEMA 1 enclosure. Enclosure shall include a pad lockable, door mounted circuit breaker and shunt trip assembly.
2. The VFD shall employ a full-wave diode bridge rectifier. Drive efficiency shall be 97% or better at full speed and full load. VFD shall maintain .95 displacement power factor regardless of speed or load.
3. The inverter section of the VFD shall be solid state, with pulse width modulated (PWM) output wave form.
4. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be listed by a nationally recognized testing agency such as UL, CUL, ETL or CSA.
5. Power line noise shall be limited to a voltage distortion factor and line notch depth as defined in IEEE Standard 519-1981, Guide for Harmonic Control and Reactive Compensation of Static Power Converters. The total harmonic voltage distortion shall not exceed 5%.
6. Motor noise as a result of the VFD shall not exceed three dB above across the line operation, measured at three feet from the motor’s center line.
7. The VFD’s full load amp rating shall meet or exceed N.E.C. Table 430-150. The VFD shall have a continuous 110% overload rating and a 155% overload rating for 60 seconds.
8. Maximum and minimum speed, independently adjustable from 10% to 100% base speed.
9. Adjustable linear acceleration and deceleration, each separately adjustable.
10. Current limit, adjustable 0% to 115%.
11. Overload trip set point that is infinitely variable based upon motor amperage. The overloads in drive should be factory set for the connected load.
12. Automatic or manual restart of the inverter if VFD trips on one of the following conditions: Line overvoltage, Phase loss, line undervoltage, bus overvoltage, overcurrent, ground fault, overload, overtemperature, external fault and motor open.
13. Automatic operation at minimum speed if input reference is lost.
15. Acceptable start/stop commands shall include closure of a contact or switch.
16. Minimum three programmable critical frequency lockout ranges.
17. VFD shall be capable of starting into a rotating motor.
18. Power disconnect to allow disconnect of VFD from input line power and VFD from equipment served.
19. Protective Features:
   a. Protection against input power undervoltage, overvoltage, and phase loss, ground fault, output current overload and instantaneous overcurrent, over temperature within the VFD enclosure, over voltage on the DC bus, output short circuit and motor winding shorting to case faults.
   b. Protect VFD from sustained power or phase loss. The VFD shall incorporate a two second power loss ride through for control circuitry only to eliminate nuisance tripping.
   c. The VFD shall incorporate semiconductor rated fuses for the input. The fuses shall be UL/CSA listed and incorporated in the standard NEMA 1 enclosure. Fuses shall be rated for 200,000 amp interrupting capacity (AIC).
20. The drives shall include the following minimum signals to interface with the building HVAC control system:
   a. Output signals:
      1) Digital “Fault” status.
      2) Drive signal indicating “Normal” operation.
      3) Drive signal indicated VFD amps.
      4) Drive signal indicating VFD speed (Hz).
      5) Drive signal indicating VFD kW.
   b. Input signals:
      1) Digital start/stop of drive.
      2) Analog speed control by 4-20 mA or 2-10 VDC signal corresponding to 0% - 100% drive speed (with adjustable gain and offset).
21. Drives shall be capable of the following displays via a digital keypad on the enclosure door:
   a. Drive ready
   b. Up to speed
   c. Run
   d. Alarm
   e. Fault
   f. Output frequency
   g. Motor speed (RPM)
   h. Motor current (all 3 phases)
   i. Frequency set point
   j. Line voltage (all 3 phases)
   k. Drive temperature
   l. Elapsed time meter
   m. Kilowatts
22. Service Conditions:
   a. Ambient temperature, 32°F to 104°F (0°C to 40°C).
   b. 0% to 95% relative humidity, non-condensing.
   c. Elevation to 3,300 feet (1,000 meters) without derating.
d. AC line voltage variation, -10% to +10% of nominal.

23. Quality Assurance:
   a. To ensure quality and minimize infantile failures at the job site, the complete VFD shall be tested by the manufacturer. The VFD shall operate a dynamometer at full load and the load and speed shall be cycled during the test.
   b. All optional features shall be functionally tested at the factory for proper operation.

24. Submittals:
   a. Submit manufacturer’s performance data including dimensional drawings, power circuit diagrams, installation and maintenance manuals, warranty description, VFD’s FLA rating, certification agency file numbers and catalog information.
   b. The specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification. If no departures from the specification are identified, the supplier shall be bound by the specification.

25. Start-up Service and Warranty:
   a. The manufacturer or vendor shall provide start-up commissioning of the variable frequency drive and its optional circuits by a certified service technician who is experienced in start-up and repair services. The commissioning personnel shall be the same personnel that shall provide the service and warranty repairs at the customer’s site. Sales personnel and other agents who are not certified technicians for VFD field repair shall not be acceptable as commissioning agents.
   b. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options and its interface wiring to the building automation system, identification and lock-out of unstable resonant frequencies, and harmonic analysis (if necessary). Start-up shall include customer operator training at the time of the equipment commissioning.
   c. The VFD shall be warranted by the manufacturer for a period of 12 months from date of start-up. The warranty shall include parts, labor, travel costs and living expenses incurred.

26. Examination:
   a. This contractor to verify that job site conditions for installation meet factory recommended and code required conditions for VFD installation prior to start-up. Including: Clearance spacing, temperature, contamination, dust and moisture of the environment. Separate conduit installation per the manufacturer’s recommendations.
   b. The VFD shall be covered and protected from installation dust and contamination until the environment is cleaned and ready for operation. The VFD shall not be operated while the unit is covered.

END OF SECTION 230913
PART 1 - GENERAL

1.1 DESCRIPTION

A. HVAC piping shall be as scheduled in SECTION 230620.

B. Pumps shall be as scheduled on the drawing and specified in SECTION 230620.

1.2 SCOPE

A. Furnish all hot water equipment and specialties of configuration, model and manufacturer indicated on the drawings or as specified hereinafter.

PART 2 - PRODUCT

2.1 SPECIALTIES

A. Manual Air Venting Devices:
   1. For hot water terminals (unless otherwise shown on drawings), provide manual air vents. Air vents shall be quarter turn open ¼” ball cocks with extended drain line, located to permit easy use.

B. Pressure relief valves shall be ASME rated for pressure and duty intended.

C. Furnish and install automatic air vents of capacity shown on plans.

END SECTION 232000
PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install a complete and working refrigerant piping system between points of connection as shown on plans and specified herein. The entire installation shall be done in a workmanlike manner and shall conform with best trade practices and EPA regulations.

PART 2 - PRODUCT

2.1 MATERIAL

A. Piping: Provide nitrogenized “ACR” hard drawn copper with solder fitting suitable for refrigerant used, of size and configuration recommended by the equipment manufacturer. Use wrought copper solder type fittings. Brazed joint compound shall be “Sil-Fos”, or approved equal.

B. Hangers: Provide copper hangers 3'-0” O.C.

PART 3 - EXECUTION

3.1 PROCEDURE

A. Test for leaks by means of nitrogen bleed process at all joints. Repair leaks and purge system and re-test. Do not use the compressor to build up pressure. System shall prove to be leak tight for a 24-hour period.

B. Dehydrate systems per manufacturer’s recommendations and best trade practices.

C. Charge with refrigerant in accordance with manufacturer’s recommendations.

D. Insulate refrigeration suction lines with ½” thick “Armaflex” insulation.

END SECTION 232300
PART 1 - GENERAL

1.1 SCOPE

A. Introduce inhibitor to the hot water system in cooperation with the Owner’s water treatment contractor. Refer also to Section 230800 for related specifications.

END OF SECTION 232500
SECTION 233100
HVAC DUCTS AND ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install all ductwork, grille boxes, plenum chambers, dampers, and all auxiliary work of any kind necessary to make the various air handling systems of the building complete and ready for satisfactory operating. All ductwork shall be constructed in accordance with SMACNA Standards for the applicable pressure classification.

B. Ductwork shall be shipped to the site sealed with tape and plastic. **Throughout construction, all open end supply/return air ductwork and terminals shall be sealed with tape and plastic until the building is free of dust. No air handling equipment shall be operated until the building is clean. Refer to DIVISION 01 and 02.**

PART 2 - PRODUCT

2.1 MATERIAL

A. Low Pressure and Medium Pressure Ductwork:


2. Volume dampers shall be furnished and installed as shown or required for balancing the systems. Dampers operators shall be of the quadrant type provided with approved operating and locking device mounted outside the duct in accessible location. Install handles to indicate position of damper blades.

3. Ductwork layouts as shown on the drawings shall be adhered to as closely as possible, however, the right is reserved to vary the runs and sizes of ductwork and to make offsets where necessary to accommodate conditions arising in the field.

4. Flexible connections shall be installed at the inlet and outlet of each fan and in main runs of ductwork where indicated. Flexible connections shall be 30 oz. glass cloth with neoprene coating on each face.

5. Seal all joints with a water based sealant, equal to DUCTMATE PROseal or approved equal, applied per manufacturer's recommendations. Joints in low pressure ductwork shall be sealed to meet SMACNA Seal Class C - 2" w.g., and medium pressure Seal Class A - 4" w.g., as applicable.

6. Dimensions of acoustically lined ductwork shown on plans are inside dimensions of the duct after the lining has been installed.

7. Sheet metal angle closures shall be provided around all ductwork penetrating walls exposed to view.

8. Flat seam construction shall be employed where standing seam may present a hazard to personnel.

9. All exposed ductwork shall have a paintable finish.
B. Spiral and Flat Oval Ductwork:
1. Spiral and flat oval ductwork shall be SMACNA recommended gauge, medium and low pressure uniseal duct and fittings as manufactured by United Sheet Metal or approved equal.
2. Duct shall be machine formed, made from standard gauge premium grade, coiled, galvanized sheet metal in a series of continuous automatic operations.
3. Duct shall be manufactured from galvanized steel meeting ASTM A-527-71 in manufacturer’s gauges.
4. Fittings shall be die-stamped SMACNA recommended gauge galvanized steel, continuously welded seams.
5. Joints shall be slip coupling type sealed with DUCTMATE PROseal or equal. Low pressure ductwork shall be sealed to meet SMACNA Seal Class C - 2” w.g., and medium pressure Seal Class A - 4” w.g., as applicable.
6. All exposed ductwork shall have a paintable finish and shall be field cleaned and prepared for final painting by others.

C. Flex Duct:
1. Flexible duct shall be Buckley “Flexmaster Type 4” insulated for heating and cooling applications.

D. Access Doors:
1. Access doors shall be provided in ductwork of the size required to completely access and functionally service equipment contained within the ductwork.
2. Access doors shall meet ASHRAE Standards criteria, and be equal to Ruskin model ADH22 for rectangular ductwork, or United McGill bolted access doors for spiral ductwork.
3. Access doors shall be installed in ductwork on upstream and downstream sides of all heating coils and as required to reset fire dampers.

E. Fire Dampers:
1. Fire dampers shall be installed where shown and/or required by all applicable codes and regulations. Dampers shall be Type B, low leakage, out airstream type and meet UL 555 rating requirements for dynamic systems. All dynamic fire dampers installed in low pressure ductwork shall be rated for 2000 feet per minute and 4” w.g. static pressure as required by UL 555.

F. All hoods and ductwork serving welding stations, grinding stations and other industrial applications shall be constructed in accordance with SMACNA “Accepted Industry practice for INDUSTRIAL DUCT CONSTRUCTION” standards. Submit hoods and ductwork fabrication details for review and approval in advance of construction.

END OF SECTION 233100
SECTION 233400
HVAC FANS

PART 1 - GENERAL

1.1 SCOPE

A. Provide fans of type scheduled on the drawings, or as manufactured by Greenheck, Twin City or Cook.

B. Capacities and types of fans shall be in accordance with fans scheduled on the drawings. Fans shall have direction and arrangement to suit space conditions, unless otherwise directed, and shall conform to the layouts shown.

C. Fan assembly shall be mounted on resilient mounts for quiet operation.

D. Vibration isolation mounts and expanded metal belt guards shall be provided for all fans as required.

E. Provide a unit mounted on-off sentinel switch for each unit. Provide remote mounted pushbutton stations with pilot lights where indicated on the drawings.

END OF SECTION 233400
SECTION 233700
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 GRILLES, REGISTERS, DIFFUSERS AND LOUVERS

   A. Furnish and install grilles, registers, diffusers and louvers of size, type and quality indicated.

   B. Provide neoprene or similar gasket on face flange of all grilles, registers and diffusers.

   C. Grilles, registers and diffusers shall be as manufactured by Price, Metal Aire, Titus or Krueger. Louvers shall be as manufactured by Greenheck, Airolite or Ruskin.

   D. Exact location of all grilles, registers, diffusers and louvers shall be coordinated with architectural details, reflected ceiling plans and shop drawings.

END OF SECTION 233700
PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install Make-Up Air Units as indicated on the drawings and specified herein, as manufactured by Trane, Sterling or Reznor.

1.2 DELIVERY, STORAGE AND HANDLING

A. Comply with manufacturer’s installation instructions for rigging, unloading, and transporting units.

B. Ship unit with minimum shipping splits. Each factory assembled shipping split shall have tags and airflow arrows on each section to indicate location and orientation in direction of airflow. Shipping splits shall be clearly defined on submittal drawings. Cost associated with non-conformance to shop drawings shall be the responsibility of the manufacturer. Each section shall have lifting lugs or shipping skid to allow for field rigging and final placement of section.

C. Deliver units to jobsite with fan motor(s), sheave(s), and belt(s) completely assembled and mounted in units.

D. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.3 START-UP AND OPERATING REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated (if applicable), condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, veering set screws torqued, and fan has been test run under observation.

1.4 WARRANTY

A. The equipment manufacturer shall provide, at no additional cost, a standard parts warranty that covers a period of one year from unit start-up or 18 months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and shall meet the capacities and ratings set forth in the equipment manufacturer’s catalog and bulletins.

END OF SECTION 235500
PART 1 - GENERAL

1.1 SCOPE

A. Provide split-system air-conditioning units of type indicated on the drawings or approved equal by Sanyo or Carrier.

B. Capacities and types of split-system air-conditioning units shall be in accordance with the equipment schedules as shown.

C. Vibration isolation mounts shall be provided for all split-system air-conditioning units as required.

D. Furnish split-system air-conditioning units with all features and accessories scheduled on plans.

1.2 WARRANTY

A. A manufacturer’s extended parts and labor warranty for five years from substantial completion shall be provided at no additional cost.

END SECTION 237400
PART 1 - GENERAL

1.1 SCOPE

A. Unit Heaters: Trane or equal product of capacity indicated, hot water type, with fan inlet screen, and adjustable discharge louver.

END OF SECTION 238200
PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Description of Integrated Automation system(s), quality expectations, materials and general requirements.

B. The new/expansion of existing EMS shall be furnished and installed by Control Technologies, Inc. (CTI).

1.2 SYSTEM(S) DESCRIPTION

A. The existing building is served by an Invensys DDC System. This system shall be extended and expanded as required to achieve the controls requirements of the new addition.

1.03 RELATED DIVISIONS and SECTIONS

A. DIVISION 00 - Procurement and Contracting Requirements

B. DIVISION 01 - General Requirements

C. DIVISION 07 - Thermal and Moisture Protection

D. DIVISION 21 - Fire Suppression

E. DIVISION 22 - Plumbing

F. DIVISION 23 - Heating, Ventilating, and Air Conditioning (HVAC)

G. DIVISION 26 - Electrical

1.3 REFERENCES

A. 2009 International Building Code


C. New Hampshire State Fire Code

D. 2009 NFPA 1, National Fire Code, as adopted and amended by NH State Fire Code

E. 2009 International Plumbing Code with NH amendments

F. 2009 International Mechanical Code

G. 2009 International Energy Conservation Code

I. City of Manchester, New Hampshire ordinances, rules and regulations

J. Manchester Fire Department rules and regulations.

K. All applicable ASTM Standards

1.4 SUBMITTALS

A. See SECTION 01320 - Administrative Requirements, for submittal procedures.

B. CTI shall be responsible for maintaining established MCC control equipment “standards”.

END OF SECTION 250000
SECTION 250100
OPERATION AND MAINTENANCE OF INTEGRATED AUTOMATION

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install, as hereinafter specified, a complete Direct Digital Control (DDC) Energy Management System (EMS). The provider and installer of the EMS shall be referred to as the ATC Contractor hereinafter.

B. CTI shall be responsible for maintaining established MCC control equipment “standards”.

END OF SECTION 250100
PART 1 - GENERAL

1.1 COMMISSIONING

A. Complete self-commissioning of the entire ATC system by the ATC Contractor is required. The ATC Contractor shall provide a written statement certifying that self-commissioning has been completed prior to executing the specified ATC sequence check by the Testing & Balancing Contractor.

B. The HVAC units manufacturer shall self-commission the units in cooperation with the ATC and T & B Contractors.

C. Commissioning procedures shall include, but not be limited to, the following:
   1. Verification of Proper Control Response: The ATC Contractor shall simulate all possible environmental conditions at controlling sensors, and shall witness, both digitally and physically, response of associated controlled devices. (For example, in response to a call for heat at a thermostat, the associated heating coil ACV modulates open to the coil.)
   2. Physical Verification of Device Positioning: The ATC Contractor shall physically verify, for example, that an ACV is fully closed when the DDC system indicates that the ACV is fully closed.
   3. Calibration of All Sensors and Thermostats: The ATC Contractor shall verify that all digital readings from controlling sensors are accurate. Digital readings from sensors and thermostats shall be compared with readings from calibrated test instruments placed next to the sensor. Testing shall be performed over the likely range of the sensor. Sensors that cannot be calibrated to match readings of test instruments, within a reasonable margin of error, shall be replaced. The ATC Contractor shall submit a written statement indicating that calibration has been performed. Statement shall include listing of all devices calibrated, documentation of test instruments used including certification of accuracy, and listing of acceptable accuracy range for each type of device calibrated.

D. If a Commissioning Agent is served by the owner to commission the subject job, the ATC Contractor shall participate in the commissioning process to the full extent required.

1.2 ATC SEQUENCE CHECK

A. This contractor shall notify the Mechanical Contractor of the completion of system installation and calibration, and schedule through same the performance of an ATC sequence check by the Testing & Balancing Subcontractor.
   1. Provide a technician who is thoroughly familiar with the project and the ATC program to work with the Balancing Contractor in verifying total system operations.
2. Should systems be found incomplete or not performing per specification, the ATC Contractor shall correct deficiencies and the Testing & Balancing Agency shall recheck until all sequences have been verified.

END OF SECTION 250800
PART 1 - GENERAL

1.1 EQUIPMENT

A. In cooperation with the ATC Contractor, the Mechanical Contractor shall:
   1. Install automatic control valves (ACV) and separable wells supplied by the ATC Contractor.
   2. Provide on magnetic starters furnished, all necessary step-down transformers and auxiliary contacts, with push buttons and switches in the required configuration. The ATC Contractor shall be responsible for coordinating needs with the Mechanical Contractor in advance of ordering.
   3. Install all gasketed, ultra-low leak automatic control dampers (ACD) supplied by the ATC Contractor.
   4. Provide necessary blank-off plates (safing) required to install dampers that are smaller than duct size.
   5. Assemble multiple section dampers with required interconnecting linkages and extend required number of shafts through duct for external mounting of damper motors.
   6. Provide access doors or other approved means of access through ducts for service of control equipment.

B. Electric Wiring:
   1. All electric wiring and wiring connections required for the installation of the control system, as herein specified, shall be provided by this contractor, unless specifically shown on the electrical drawings or called for in the electrical specifications.
   2. The control system shall be installed and wired by factory trained and certified technicians in accordance with all pertinent codes, particularly the National Electric Code (N.E.C.). All low voltage communication wiring run in areas or spaces susceptible to damage, i.e., the Boiler Room, etc., shall be protected within EMT. All other may be plenum rated cable secured to structure within walls or ceiling space as high as possible in a workmanlike manner, installed to eliminate risk of accidental pull or cutting by other contractors.

C. Service and Training:
   1. Relative to the EMS, the ATC Contractor shall provide start-up, commissioning and Owner representative training by a certified service technician who is experienced in start-up, repair and training services. The commissioning personnel shall be the same personnel who installed the system and shall provide service and warranty repairs.
   2. There shall be at least 24 hours of Owner training time carried in the contract. The ATC Contractor shall provide a course outline and training manuals for all training classes at least six (6) weeks prior to the first class. The Owner reserves the right to modify any or all of the training course outline and training materials. Review and approval by Owner’s representatives of material to be reviewed in the training sessions shall be completed at least three (3) weeks prior to first class.
D. Submittals:

1. Submit shop drawings with detailed wiring diagrams, bill of materials and description of systems operations, in accordance with SECTION 01310.

2. Provide the Owner’s representatives any additional information or data which is deemed necessary to determine compliance with these specifications or which is deemed valuable in documenting the system to be installed.

3. Submit the following:
   a. A complete bill of materials of equipment to be used indicating quantity, manufacturer and model number.
   b. A schedule of all control valves including the valve size, model number (including pattern and connections), flow, CV rating, pressure rating and location.
   c. A schedule of all control dampers. This shall include the damper size, pressure drop, manufacturer and model number.
   d. Provide manufacturers cut sheets for major system components. When manufacturer’s cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is being submitted to cover. Include:
      1) All EMS DDC controllers.
      2) Graphical User Interface (GUI) host computer.
      3) Auxiliary control devices.
      4) Proposed control system riser diagram showing system configuration, device locations, addresses and cabling.
      5) Detailed termination drawings showing all required field and factory terminations. Terminal numbers shall be clearly labeled.
      6) Points list showing all system objects, and the proposed English language object names.
      7) Sequence of operations for each system under control, specific to this project.
      8) Provide a BACnet Product Implementation Conformance Statement (PICS) for each BACnet device type in the submittal, or LONMARK Interoperability Statement.
      9) Color prints of proposed graphics with a list of points for display.

5. Upon completion of installation, submit three (3) copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:
   a. Project Record Drawings shall be as-built versions of the submittal shop drawings. One set of electronic media including CAD .DWG or .DXF drawing files shall also be provided.
   b. Testing and Commissioning Reports and Checklists.
   c. Operation & Maintenance (O&M) manual shall be as-built versions of the submittal product data. In addition to that required for the submittals, the O&M manual shall include:
      1) Names, address, and 24-hour telephone numbers for the ATC Contractor’s service department.
      2) Operators Manual with procedures of operating the control systems including logging On/Off, alarm handling, producing point reports, trending data, overriding computer control, and changing setpoints and other variables.
3) Programming Manual with a description of the programming language including syntax, statement descriptions including algorithms and calculations used, point database creation and modification, program creation and modification, and use of the editor.

4) Engineering, Installation and Maintenance Manual(s) that explains how to design and install new points, panels, and other hardware; preventative maintenance and calibration procedures; how to debug hardware problems; and how to repair or replace hardware.

5) A listing and documentation of all custom software created using the programming language including the point database. One set of magnetic media containing files of the software and database shall also be provided.

6) One set of electronic media containing files of all color-graphic screens created for the project.

7) A list of recommended spare parts with part numbers and supplier.

8) Complete original issue documentation, installation, and maintenance information for all third party hardware provided including computer equipment and sensors.

9) Complete original issue media for all software provided including graphics software.

10) Licenses, Guarantee, and Warrantee documents for all equipment and systems.

11) Recommended preventive maintenance procedures for all system components including a schedule of tasks (inspection, cleaning, calibration, etc.) time between tasks, and task descriptions.

E. Warranty:

1. Warrant all work as follows:
   a. Labor and materials for control system specified shall be warranted free from defects for a period of 12 months after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The contractor shall respond to the Owner’s request for warranty service within 24 hours during customary business hours.
   b. At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner’s representative, the Owner shall sign certificates certifying that the control system’s operation has been tested and accepted in accordance with the terms of this specification. The date of Owner’s acceptance shall be the start of warranty.
   c. GUI software, project specific software, graphics, database, and firmware updates shall be provided to the Owner at no charge during the warranty period. Written authorization by Owner must, however, be granted prior to the installation of such changes.
   d. Browser access to question/answer forum, graphics library, user tips, upgrades, and training schedules.
PART 2 - PRODUCT

2.1 AUTOMATIC CONTROL DAMPERS

A. Damper frames shall be 16 gauge galvanized sheet metal or \( \frac{1}{8} \)" extruded aluminum with reinforced corner bracing.

B. Damper blades shall not exceed 8" in width or 48" in length. Blades are to be suitable for medium velocity performance (2,000 fpm). Blades shall be not less than 16 gauge.

C. Damper shaft bearings shall be as recommended by manufacturer for application.

D. All blade edges and top and bottom of the frame shall be provided with compressible seals. Side seals shall be compressible stainless steel. The blade seals shall provide for a maximum leakage rate of 10 CFM per square foot at 2.5" w.c. differential pressure.

E. All leakage testing and pressure ratings will be based on AMCA Publication 500.

F. Individual damper sections shall not be larger than 48” x 60”. Provide a minimum of one damper actuator per section.

G. Control dampers shall be parallel or opposed blade types as scheduled on drawings.

H. Dampers shall be insulated type, similar to Ruskin model CD40x2 where called for on the drawings.

2.2 CONTROL VALVES

A. Control valves shall be two-way type for two-position or modulating service as scheduled or shown.

B. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
   1. Water Valves:
      a. Two-way: 150% of total system (pump) head.

C. Water Valves:
   1. Body and trim style and materials shall be per manufacturer’s recommendations for design conditions and service shown, with equal percentage ports for modulating service.
   2. Sizing Criteria:
      a. Two-position service: Line size.
      b. Two-way modulating service: Pressure drop shall be equal to twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or 3 psi, whichever is greater.
      c. Valves \( \frac{1}{2} \)” through 2” shall be bronze body or cast brass ANSI Class 250, spring loaded, Teflon packing, quick opening for two-position service. Two-way valves to have replaceable composition disc, or stainless steel ball.
d. 2½” valves and larger shall be cast iron ANSI Class 125 with guided plug and Teflon packing.

3. Water valves shall fail normally open or closed as scheduled on plans or as follows:
   a. Heating coils in air handlers - normally-open.
   b. Hydronic terminals control valves - normally-open.
   c. Other applications - as scheduled or as required by sequence of operation.

2.3 ELECTRONIC DAMPER/VALVE ACTUATORS

A. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.

B. Where shown, for power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing.

C. All rotary spring return actuators shall be capable of either clockwise or counter clockwise spring return operation. Linear actuators shall spring return to the retracted position.

D. Proportional actuators shall accept a 0-10 VDC or 0-20 mA control signal and provide a 2-10 VDC or 4-20 mA operating range.

E. All 24 VAC/DC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 W for DC applications. Actuators operating on 120 VAC or 230 VAC shall not required more than 11 VA.

F. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper or valve when the actuator is not powered. Spring-return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.

G. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation

H. Actuators shall be provided with a conduit fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.

I. Actuators shall be UL Standard 873 listed.

J. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator’s rated torque.

2.4 OUTDOOR AIR SENSORS

A. Outdoor air sensors shall be provided of the type required to provide the sequence of control specified.

B. Outside sensors shall be located high on a shaded wall and shall be vandal resistant.
2.5 THERMOSTATS/TEMPERATURE SENSORS

A. This contractor shall provide space thermostats/sensors where indicated on plans. All space temperature sensors shall include local adjustment capability. However, through the GUI, the Owner must be able to limit the range of local adjustment and/or to lockout local adjustment altogether. Furnish and install vandal proof guards where indicated on plans. Wire guards shall not be used. Submit proposed thermostats/temperature sensors and guards for review and approval.

2.6 OCCUPANCY SENSORS

A. Furnish dual technology passive infrared/ultrasonic occupancy sensors equal to Watt Stopper Model DT-200 with compatible 24VDC power packs for indexing occupied/unoccupied control sequences. Occupancy sensors shall have an adjustable delay cycle to help prevent “False Off” signals and resultant short cycling of controlled equipment.

END OF SECTION 251000
PART 1 - EXECUTION

1.1 SEQUENCES OF OPERATION

A. Global Valve Control:
   1. To facilitate hot water system balancing, global commands shall be programmed to open all hot water ACV’s installed under this contract.

B. Occupancy Control:
   1. Occupancy schedule for all time indexed equipment and components described herein shall be established through the DDC Energy Management System (EMS).
   2. Where called for on the drawings, provide dual technology passive infrared/ultrasonic occupancy sensors equal to Watt Stopper model DT-200 with compatible 24Vdc power packs for indexing occupied/unoccupied control sequences for equipment and components described herein. Occupancy sensors shall have an adjustable delay cycle to help prevent “false off” signals and resultant short cycling of equipment.
   3. In addition, Owner shall have capability to program an adjustable occupied signal delay, and to lock out occupancy sensor control altogether, during selected periods of the day. (For example, to prevent a zone from going into occupied mode during custodial work at night.)
   4. In general, locate occupancy sensors in corner of room at top of wall (near ceiling), with the door to the room on one of the two walls that form the corner (so that the sensor cannot “see” out the door). Submit proposed sensor locations for review and approval prior to installation.

C. UH Control:
   1. Unit fan and two-way, two-position, electric ACV shall cycle as required to maintain thermostat setting. On a call for heat, valve opens and fan starts. When the space temperature is satisfied, the valve shall close and fan shuts off. Thermostat shall be remote as indicated on plans. Provide a strap-on aquastat on the HWR line to prevent unit from operating when leaving water is below 100°F (adj.).

D. Smoke Detectors:
   1. Air handling equipment scheduled on drawings shall have a duct mounted smoke detector(s) furnished by the Electrical Contractor and installed by the Mechanical Contractor in the supply air ductwork and return air ductwork (where applicable).
   2. The ATC Contractor shall furnish and install low voltage wiring between smoke detector and air handling unit to automatically stop the supply and return fan (where applicable) upon sensing of smoke in the supply and/or return (where applicable) air stream.
3. Smoke detector status and alarm shall be presented through the EMS.

E. EF-1, 3, 4 & 5 Control:
   1. A line voltage switch shall be furnished and installed by the electrical contractor and wired through the associated VFD (provided by the mechanical contractor) to the associated exhaust fan. The ATC Contractor shall program the VFD for soft start function and proper speed in cooperation with the Testing & Balancing sub-contractor.

F. EF-2 Control:
   1. EF-2 shall be interconnected with low voltage wire from a time relay furnished with the Plasma Cutter to the associated VFD (provided by the mechanical contractor). The ATC Contractor shall furnish and install said low voltage wiring, plus program the VFD for soft start function and proper speed in cooperation with the Testing & Balancing sub-contractor.

G. EF-7 Control:
   1. The ATC Contractor shall index EF-7 for time schedule capability, but set up for 24/7 operation.

H. MUA-1 & 2 Control:
   1. The MUA’s are provided with no EMS interface capability. The ATC Contractor shall install all sensors, controllers and specialties required for EMS interface.
   2. Gas control for the new MUA’s shall be 0 to 10 VDC electronic modulation type furnished with the units. Each unit has three (3) burner sections. The MUA’s shall contribute heat based on command from associated space thermostat. Provide a low discharge air limit controller for each unit set at 60°F (adj.).
   3. The ATC Contractor shall interlock MUA-1 with EF-1, 2, 3 and 4. If any of said fans are manually activated, then MUA-1 shall start.
   4. The ATC Contractor shall interlock MUA-2 with EF-3, 4 and 5. If any of said fans are manually activated, then MUA-2 shall start.
   5. The ATC Contractor shall provide pressure sensors in the space to manage the outside air intake damper in the MAU’s to maintain neutral pressure.
   6. During the unoccupied mode, unless one of the exhaust fan interlocks described above is initiated, MUA-1 and MUA-2 shall be off. However, upon a drop in space temperature below the associated thermostat’s set point, the MUA shall operate in 100% return air mode until the space temperature is satisfied and then de-energize.

END OF SECTION 259000
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Applicable provisions of Division 1 shall govern work under this section.

B. Refer to Division 7 – Through-Penetration Firestop Systems, for sealing requirements at penetrations of fire rated surfaces.

1.2 CODES AND PERMITS

A. Perform all work in strict accordance with the requirements of the 2011 NEC, 2009 IEEC and the 2009 IBC. Requirements outlined therein shall be minimum as related to this work.

B. Arrange for Code required inspections and pay for same if not covered by permit costs.

1.3 WORK PRIORITY AND COORDINATION

A. Contractor, his mechanics and subcontractors shall cooperate with all others so construction may proceed without hindrances and in all cases to the best interests of the Owner. Confer with others regarding any work that may affect this work and arrange piping, ductwork, equipment, etc. in proper relation to that of others. Coordinate prior to installation the arrangement of electrical work as related to plumbing, HVAC and general construction work.

1.4 DRAWINGS

A. The drawings are schematic in nature indicating the general location of all electrical equipment and devices. While the sizes and locations have been indicated, the Contractor shall properly adjust his work to meet conditions as they actually exist on the premises. Equipment and devices shall provide adequate and acceptable clearance for entry, servicing and maintenance. Minor adjustments shall be discussed with the Engineer with the view to convenience of operation and noninterference with other work. The Engineer reserves the right to change the location of any conduit, device or piece of equipment to suit conditions, with no added cost to the Owner if the requested change does not modify the scope of work. Should the particular equipment which any contractor proposes to install require other space conditions, other utility service, or other structural support than those indicated on the drawings, the Contractor shall arrange for such changes with other affected Contractors and with the Architect. Required changes shall be noted on the submittal cover sheet. Should changes become necessary the Contractor shall make such changes at his expense.

1.5 SUBMITTALS

A. Furnish shop drawings on items as indicated in individual sections including switchgear, devices, fixtures, firestopping, fire alarm equipment, and other equipment. See Division
1 for Submittal requirements. The contractor acknowledges its responsibility to submit complete shop drawings and other required submittals. Incomplete submittals will be returned to the contractor unreviewed. No time extensions or cost increases will be allowed for delays caused by return of incomplete submittals. Shop drawings for equipment which are noted as being reviewed by Architect or his Engineer shall not supersede Contract Documents or relieve Contractor from responsibility for deviations from the Contract Documents.

B. Furnish 2 sets of standard operating instructions and complete repair parts lists for the Owner for items of equipment and controls. Also include a summary of maintenance procedures required monthly, yearly, etc. for all equipment. Submit in binders to Engineer for approval.

1.6 REMODELING WORK

A. Wherever remodeling work or demolition of existing equipment, light fixtures, conduit, etc. is a part of plans and specifications, Contractor shall visit the site and thoroughly examine all existing conditions. Provide all required work necessary for interconnection of existing services with new system and removal of existing unused components.

B. Contractors shall notify the Architect at least 10 days prior to the bid closing date of any deviations or required changes that are noticed. No allowance for additional costs for work related to existing conditions will be permitted after bidding unless proof of hidden work, breakage or damage could not be determined by inspection or examination by the Contractor.

1.7 HOUSEKEEPING

A. This Contractor shall periodically remove debris caused by his operations. On completion he shall remove all debris from his work and leave same neat and clean, ready for use by the Owner.

1.8 PROTECTION OF MATERIALS AND EQUIPMENT

A. Materials and equipment shall be protected at all times. This Contractor shall be responsible for all damage caused directly or indirectly by his workmen. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury. At the completion of all work, the equipment shall be thoroughly cleaned and delivered to the Owner in a condition satisfactory to the Engineer.

B. Equipment shall not be used during construction unless approved in writing by the Engineer. Equipment used during construction shall be returned to the original condition, which may include such items as replacing lamps, cleaning lenses, and replacing damaged devices.

1.9 PAINTING

A. All equipment shall have manufacturer's standard baked enamel finish and shall not be job painted "unless otherwise specified". Equipment in finished rooms shall have color selected by Engineer from manufacturer's standard colors. All required touch up painting of pre-finished surfaces by this Contractor.
1.10 INSTRUCTIONS

A. The Contractor shall review with the Owner's representative complete operating and maintenance procedures for equipment and systems installed under this contract. Provide 1 day of instruction during normal working hours when systems are fully operational and before final payment.

PART 2 - PRODUCTS

2.1 QUALITY REQUIREMENTS

A. Items indicated on the drawings and in the specifications are listed by manufacturer in order to describe minimum quality requirements.

B. Materials and equipment shall conform to requirements of National Electrical Code and the International Building Code.

C. All materials and equipment furnished shall be new and shall be the standard products of manufacturers regularly engaged in the production of Electrical and Fire Alarm materials and equipment.

END OF SECTION 260000
SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:
   1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2 and 3 control cables.
   2. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

A. VFC: Variable frequency controller.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

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

B. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Alcan Products Corporation; Alcan Cable Division.
   2. Alpha Wire.
   3. Belden Inc.
   5. General Cable Technologies Corporation.

C. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

D. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2, Type XHHW-2 and Type SO.
E. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for Type SO and Type PPE with ground wire.

2.2 CONNECTORS AND SPLICES

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

1. AFC Cable Systems, Inc.
2. Gardner Bender.
4. Ideal Industries, Inc.
5. Ilsco; a branch of Bardes Corporation.
6. NSi Industries LLC.
7. O-Z/Gedney; a brand of the EGS Electrical Group.
8. 3M; Electrical Markets Division.

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

2.3 SYSTEM DESCRIPTION

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

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

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

B. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway Type XHHW-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway Metal-clad cable, Type MC.
C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway Type XHHW-2, single conductors in raceway.

D. Exposed Branch Circuits, Including in Crawlspace: Type THHN-2-THWN-2, single conductors in raceway.

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

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

G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application. Type PPE, extra hard usage for sizes greater than #2 AWG.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

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

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

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

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

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

3.4 CONNECTIONS

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

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

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

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

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

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 7 "Penetration Firestopping."

END OF SECTION 260519
SECTION 260523
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Low-voltage control cabling.
   2. Control-circuit conductors.
   3. Identification products.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

C. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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

2.2 PERFORMANCE REQUIREMENTS

A. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262 by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
   1. Flame Travel Distance: 60 inches (1520 mm) or less.
   2. Peak Optical Smoke Density: 0.5 or less.
   3. Average Optical Smoke Density: 0.15 or less.
B. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.

C. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.3 LOW-VOLTAGE CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.
   1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
   2. PVC insulation.
   3. Unshielded.
   4. PVC jacket.
   5. Flame Resistance: Comply with UL 1685.

B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
   1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
   2. PVC insulation.
   3. Unshielded.
   4. PVC jacket.
   5. Flame Resistance: Comply with NFPA 262.

2.4 CONTROL-CIRCUIT CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Encore Wire Corporation.
   2. General Cable Technologies Corporation.

B. Class 1 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.

C. Class 2 Control Circuits: Stranded copper, complying with UL 44.

D. Class 3 Remote-Control and Signal Circuits: Stranded copper, complying with UL 44.

PART 3 - EXECUTION

3.1 INSTALLATION OF RACEWAYS AND BOXES

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
   1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.
   2. Flexible metal conduit shall not be used.
3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1 and NFPA 70.

B. General Requirements for Cabling:
   1. Cables may not be spliced.
   2. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
   3. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
   5. Support: Do not allow cables to lay on removable ceiling tiles.
   6. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.

C. Open-Cable Installation:
   1. Suspend copper cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 30 inches (760 mm) apart.
   2. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

3.3 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified for future use with a tag.

3.4 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:
   1. Class 1 remote-control and signal circuits; No 14 AWG.
   2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
   3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.5 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

3.6 GROUNDING

A. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
3.7 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

END OF SECTION 260523
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 grounding and bonding systems and equipment.

1.3 QUALITY ASSURANCE

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

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Burndy; Part of Hubbell Electrical Systems.
2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries, Inc.; Electrical Products Division, LLC.
6. Harger Lightning and Grounding.
7. ILSCO.
9. Robbins Lightning, Inc.
10. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

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

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

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

B. Bare Copper Conductors:
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.4 CONNECTORS

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

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for #10 AWG and smaller, and stranded conductors for #8 AWG and larger unless otherwise indicated.

B. Conductor Terminations and Connections:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

3.2 EQUIPMENT GROUNDING

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

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

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
B. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

END OF SECTION 260526
SECTION 260529
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.

B. Related Sections include the following:
   1. Section 260548 "Vibration and Seismic Controls for Electrical Systems" for installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 QUALITY ASSURANCE

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

B. Comply with NFPA 70.
A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

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:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   5. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. Fabco Plastics Wholesale Limited.
      d. Seasafe, Inc.
   2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
   3. Fitting and Accessory Materials: Same as channels and angles.
   4. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

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. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Cooper B-Line, Inc.; a division of Cooper Industries.
         2) Empire Tool and Manufacturing Co., Inc.
         3) Hilti Inc.
         4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
         5) MKT Fastening, LLC.
   2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
   3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
   4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
   5. Toggle Bolts: All-steel springhead type.

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. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with two-bolt conduit clamps.

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 (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Section 099123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529
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. Section Includes:
      1. Metal conduits, tubing, and fittings.
      2. Nonmetal conduits, tubing, and fittings.
      3. Metal wireways and auxiliary gutters.

1.3 DEFINITIONS
   A. GRC:  Galvanized rigid steel conduit.
   B. IMC:  Intermediate metal conduit.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS
   A. Manufacturers:  Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      1. AFC Cable Systems, Inc.
      3. Anamet Electrical, Inc.
      4. Electri-Flex Company.
      5. O-Z/Gedney.
      6. Picoma Industries.
      7. Republic Conduit.
      8. Robroy Industries.
     10. Thomas & Betts Corporation.
     11. Western Tube and Conduit Corporation.
   B. Listing and Labeling:  Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   C. GRC:  Comply with ANSI C80.1 and UL 6.
D. IMC: Comply with ANSI C80.6 and UL 1242.
E. EMT: Comply with ANSI C80.3 and UL 797.
F. FMC: Comply with UL 1; zinc-coated steel.
G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Fittings for EMT:
      a. Material: Steel.
      b. Type: Setscrew or compression.
   2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
I. Joint Compound for IMC, GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. AFC Cable Systems, Inc.
   2. Anamet Electrical, Inc.
   3. Arnco Corporation.
   4. CANTEX Inc.
   5. CertainTeed Corporation.
   7. Electri-Flex Company.
   8. Kraloy.
   9. Lamson & Sessions; Carlon Electrical Products.
   10. Niedax-Kleinhuis USA, Inc.
   11. RACO; Hubbell.
   12. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
D. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
E. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper B-Line, Inc.
   2. Hoffman.
   4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 4 unless otherwise indicated, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Adalet.
   2. Cooper Technologies Company; Cooper Crouse-Hinds.
   3. EGS/Appleton Electric.
   5. FSR Inc.
   8. Kraloy.
   10. Mono-Systems, Inc.
   12. RACO; Hubbell.
   13. Robroy Industries.
   14. Spring City Electrical Manufacturing Company.
   15. Stahlin Non-Metallic Enclosures.
   17. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

H. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep) 4 inches by 2-1/8 inches by 2-1/8 inches deep (100 mm by 60 mm by 60 mm deep).

I. Gangable boxes are prohibited.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC IMC.
   2. Concealed Conduit, Aboveground: GRC IMC.
   3. Underground Conduit: RNC.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed, Not Subject to Severe Physical Damage: EMT.
   3. Exposed and Subject to Severe Physical Damage: GRC IMC. Raceway locations include the following:
      a. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      b. Below 8’ AFF on the shop floor.
   4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   6. Connecting to Equipment that is changed each semester (as indicated on plans): SO, PPE.
   7. Damp or Wet Locations: GRC IMC.
   8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings
      unless otherwise indicated. Comply with NEMA FB 2.10.
   2. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
   3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply
      with NEMA FB 2.20.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where
   requirements on Drawings or in this article are stricter.

B. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies
   and number of floors.

C. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or
   hot-water pipes. Install horizontal raceway runs above water and steam piping.

D. Complete raceway installation before starting conductor installation.

E. Comply with requirements in Section 260529 "Hangers and Supports for Electrical
   Systems" for hangers and supports.

F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of three 90-degree bends in any conduit run except
   for control wiring conduits, for which fewer bends are allowed. Support within 12
   inches (300 mm) of changes in direction.

H. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise
   indicated. Install conduits parallel or perpendicular to building lines.

I. Support conduit within 12 inches (300 mm) of enclosures to which attached.

J. Stub-ups to Above Recessed Ceilings:
   1. Use EMT, IMC, or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in
      hubs or in an enclosure.

K. 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.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating
   bushings to protect conductors including conductors smaller than No. 4 AWG.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of
   boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and
   insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits
   terminated with locknuts.
N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

R. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces or between exterior and interior locations.
   2. Where otherwise required by NFPA 70.

S. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
   1. Use LFMC in damp or wet locations.

U. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

W. Locate boxes so that cover or plate will not span different building finishes.

X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits u.n.o.

3.3 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 7 "Penetration Firestopping."
3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 260533
SECTION 260548
VIBRATION AND SEISMIC CONTROLS 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. Contractor shall provide an “Electrical Vibration-Control and Seismic-Restraint Schedule” identifying equipment to be controlled, how the equipment is to be controlled. See Part 3 for representative schedule.

B. Related Sections include the following:
   1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 DEFINITIONS


C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:
   1. Site Class as Defined in the IBC: D (Default).
   2. Assigned Seismic Use Group or Building Category as Defined in the IBC: II.
      a. Component Importance Factor: 1.0.
      b. Component Response Modification Factor: 1.5.
      c. Component Amplification Factor: 1.0.
   3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 5% Damping.
   4. Design Spectral Response Acceleration at 1.0-Second Period: 5% Damping.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
b. Annotate to indicate application of each product submitted and compliance with requirements.


B. Delegated-Design Submittal: For seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.
   a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other electrical Sections for equipment mounted outdoors.

2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.

3. Field-fabricated supports.

4. Seismic-Restraint Details:
   a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
   b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events.
   c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

5. Electrical Vibration-Control and Seismic-Restraint Schedule, including:
   a. Transformers
   b. Conduits
   c. Panelboards
   d. Light Fixtures

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that 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. Comply with seismic-restraint requirements in the IBC.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals
based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

E. Comply with NFPA 70.

1.7 PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

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

3.2 ADJUSTING

A. Adjust isolators after isolated equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.3 EXAMPLE OF “ELECTRICAL VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE SCHEDULE”

A. Supported or Suspended Equipment: <Insert name and drawing designation>.
   1. Equipment Location: <Insert room number>.
   2. Pads:
      a. Material: [Neoprene] [Rubber] [Hermetically sealed compressed fiberglass].
      b. Thickness: <Insert inches (mm)>.
      c. Durometer: <Insert number>.
      d. Number of Pads: <Insert number> thick.
   3. Isolator Type: <Insert generic name or designation used in Part 2>.
   4. Component Importance Factor: [1.0] [1.5].
   5. Component Response Modification Factor: [1.5] [2.5] [3.5] [5.0].
   6. Component Amplification Factor: [1.0] [2.5].

END OF SECTION 260548
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 of power and control cables.
   2. Identification for conductors.
   4. Warning labels and signs.
   5. Instruction signs.
   7. Miscellaneous identification products.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.
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.

1.4 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 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 cable size.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Tape:
   1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
   2. Printing on tape shall be permanent and shall not be damaged by burial operations.
   3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:
   1. Comply with ANSI Z535.1 through ANSI Z535.5.
   2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE.
   3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE.

2.4 WARNING LABELS AND SIGNS


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. Metal-Backed, Butyrate Warning Signs:
   1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
   2. 1/4-inch (6.4-mm) grommets in corners for mounting.
   3. Nominal size, 10 by 14 inches (250 by 360 mm).

D. Warning label and sign shall include, but are not limited to, the following legends:
   1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.5 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 (10 mm).

B. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in 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. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.

G. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. 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 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.
      c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) 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.

B. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.

C. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive, self-laminating polyester labels with the conductor designation.

   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
   1. Limit use of underground-line warning tape to direct-buried cables.
   2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
F. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
   a. Indoor Equipment: Adhesive film label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label or Stenciled legend 4 inches (100 mm) high.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:
   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Enclosed switches.
   e. Enclosed circuit breakers.
   f. Enclosed controllers.
   g. Variable-speed controllers.
   h. Remote-controlled switches, dimmer modules, and control devices.
   i. Panic Buttons

END OF SECTION 260553
PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section includes a computer-based, short circuit, protective device coordination and arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

   B. Short circuit study shall be used to determine equipment AIC ratings for equipment submittals.

1.3 DEFINITIONS
   A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

   B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

   C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

   D. SCCR: Short-circuit current rating.

   E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS
   A. Product Data: For computer software program to be used for studies.

   B. Other Action Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals may be in digital form.
      1. Arc-flash study input data, including completed computer program input data sheets.
      2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.
         a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect
for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
   1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers: Subject to compliance with requirements, provide software by the following:
   1. SKM Systems Analysis, Inc.

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:
   1. Protective device designations and ampere ratings.
   2. Cable size and lengths.
   3. Transformer kilovolt ampere (kVA) and voltage ratings.
   4. Motor and generator designations and kVA ratings.
   5. Switchgear, switchboard, motor-control center and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.
E. Short-Circuit Study Output:
   1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
      a. Voltage.
      b. Calculated symmetrical fault-current magnitude and angle.
      c. Fault-point X/R ratio.
      d. No AC Decrement (NACD) ratio.

F. Incident Energy and Flash Protection Boundary Calculations:
   1. Arcing fault magnitude.
   2. Protective device clearing time.
   3. Duration of arc.
   5. Working distance.
   6. Incident energy.

G. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch (76-by-127-mm) thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
   1. Location designation.
   2. Nominal voltage.
   3. Flash protection boundary.
   5. Incident energy.
   7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.
3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:
   1. To normal system low-voltage load buses where fault current is 10 kA or less.
   2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:
   1. Low-voltage switchgear.
   2. Branch circuit panelboards.
   3. Equipment disconnects.

3.3 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Use the short-circuit study output and the field-verified settings of the overcurrent devices.

C. Calculate maximum contributions of fault-current size.
   1. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except 240-V ac and 208-V ac systems fed from transformers less than 125 kVA.

F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.
G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:
1. Fault contribution from induction motors should not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:
1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.4 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.
1. Verify completeness of data supplied on the one-line diagram on Drawings. Call discrepancies to the attention of Architect.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers.

B. Gather and tabulate the following input data to support coordination study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field.
1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
5. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
6. Motor horsepower and NEMA MG 1 code letter designation.
7. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
3.5 LABELING

A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects.

3.6 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner’s maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION 260573
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. Indoor occupancy sensors.

B. Related Requirements:
   1. Section 262726 "Wiring Devices" for manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.
   1. Interconnection diagrams showing field-installed wiring.
   2. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bryant Electric; a Hubbell company.
   2. Cooper Industries, Inc.
   3. Hubbell Building Automation, Inc.
   5. Lightolier Controls.
   6. Lithonia Lighting; Acuity Lighting Group, Inc.
   7. Lutron Electronics Co., Inc.
   8. NSi Industries LLC; TORK Products.
   9. RAB Lighting.
   10. Sensor Switch, Inc.
   11. Square D; a brand of Schneider Electric.
   12. Watt Stopper.
B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
   3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
   4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   5. Mounting:
      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
      c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
   6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
   7. Bypass Switch: Override the "on" function in case of sensor failure.

C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
   1. Sensitivity Adjustment: Separate for each sensing technology.
   2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
   3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

2.2 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bryant Electric; a Hubbell company.
   2. Cooper Industries, Inc.
   3. Hubbell Building Automation, Inc.
   5. Lightolier Controls.
   6. Lithonia Lighting; Acuity Lighting Group, Inc.
   7. Lutron Electronics Co., Inc.
   8. NSi Industries LLC; TORK Products.
   9. RAB Lighting.
   10. Sensor Switch, Inc.
   11. Square D; a brand of Schneider Electric.
12. **Watt Stopper**

B. **General Requirements for Sensors**: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. **Operating Ambient Conditions**: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
   3. **Switch Rating**: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

### 2.3 CONDUCTORS AND CABLES

A. **Power Wiring to Supply Side of Remote-Control Power Sources**: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. **Classes 2 and 3 Control Cable**: Multiconductor cable with stranded-copper conductors not smaller than No. 22 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. **Class 1 Control Cable**: Multiconductor cable with stranded-copper conductors not smaller than No. 16 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### PART 3 - EXECUTION

#### 3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

#### 3.2 WIRING INSTALLATION

A. **Wiring Method**: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).

B. **Wiring within Enclosures**: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. **Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.**

D. **Splices, Taps, and Terminations**: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
   1. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 6 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
   1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
   2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923
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: Lighting control panels using mechanically held relays for switching.

1.3 DEFINITIONS

A. BAS: Building automation system.
B. IP: Internet protocol.
C. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.
D. PC: Personal computer; sometimes plural as "PCs."
E. RS-485: A serial network protocol, similar to RS-232, complying with TIA-485-A.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control modules, power distribution components, relays, manual switches and plates, and conductors and cables.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
B. Shop Drawings: For each relay panel and related equipment.
   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail wiring partition configuration, current, and voltage ratings.
   4. Short-circuit current rating of relays.
   5. Include diagrams for power, signal, and control wiring.
   6. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting controls to include in emergency, operation, and maintenance manuals.
B. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On magnetic media or compact disk, complete with data files.
   3. Device address list.
   4. Printout of software application and graphic screens.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Lighting Control Relays: Equal to 25 percent of amount installed, but no fewer than 8.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and prepare panels for installation according to NECA 407.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Input signal from field-mounted manual switches, or digital signal sources, shall open or close one or more lighting control relays in the lighting control panels. Any combination of inputs shall be programmable to any number of control relays.

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

C. Comply with 47 CFR, Subparts A and B, for Class A digital devices.

D. Comply with UL 916.

2.2 NETWORKED LIGHTING CONTROL PANELS

A. Products: Subject to compliance with requirements, provide one of the following:
   2. General Electric Company, GE Consumer & Industrial - Electrical Distribution; LVRC.
   3. Touch-Plate Technologies; Control Plus.
   4. WattStopper, a Legrand Group brand; Lighting Integrator.

B. Description: Lighting control panels using mechanically latched relays to control lighting and appliances. The panels shall be capable of being interconnected with digital communications to appear to the operator as a single lighting control system.

C. Lighting Control Panels:
   1. A single enclosure with incoming lighting branch circuits, control circuits, switching relays, and on-board timing and control unit.
2. A vertical barrier separating branch circuits from control wiring.

D. Main Control Unit: Installed in the main lighting control panel only; powered from the branch circuit of the standard control unit.

1. Ethernet Communications: Comply with MS Windows TCP/IP protocol. The main control unit shall provide for programming of all control functions of the main and all networked slave lighting control panels including timing, sequencing, and overriding.

2. Compliance with ASHRAE 135: Controllers shall support serial MS/TP and Ethernet IP communications, and shall be able to communicate directly via BAS RS-485 serial networks and Ethernet 10Base-T networks as a native device.

3. Web Server: Display information listed below over a standard Web-enabled server for displaying information over a standard browser.
   a. A secure, password-protected login screen for modifying operational parameters, accessible to authorized users via Web page interface.
   b. Panel summary showing the master and slave panels connected to the controller.
   c. Controller diagnostic information.
   d. Show front panel mimic screens for setting up controller parameters, input types, zones, and operating schedules. These mimic screens shall also allow direct breaker control and zone overrides.

4. Timing Unit:
   a. 365-day calendar, astronomical clock, and automatic adjustments for daylight savings and leap year.
   b. Clock configurable for 12-hour (A.M./P.M.) or 24-hour format.
   c. Four independent schedules, each having 24 time periods.
   d. Schedule periods settable to the minute.
   e. Day-of-week, day-of-month, day-of-year with one-time or repeating capability.
   f. 16 special date periods.

5. Time Synchronization: The timing unit shall be updated not less than every 4 hour(s) with the network time server.

6. Sequencing Control with Override:
   a. Automatic sequenced on and off switching of selected relays at times set at the timing unit, allowing timed overrides from external switches.
   b. Sequencing control shall operate relays one at a time, completing the operation of all connected relays in not more than 10 seconds.
   c. Override control shall allow any relay connected to it to be switched on or off by a field-deployed manual switch or by an automatic switch, such as an occupancy sensor.
   d. Override control "blinking warning" shall warn occupants approximately five minutes before actuating the off sequence.
   e. Activity log, storing previous relay operation, including the time and cause of the change of status.
   f. Download firmware to the latest version offered by manufacturer.

E. Standard Control Unit, Installed in All Lighting Control Panels: Contain electronic controls for programming the operation of the relays in the control panel, contain the status of relays, and contain communications link to enable the digital functions of the main control unit. Comply with UL 916.
1. Electronic control for operating and monitoring individual relays, and display relay on-time.
2. Nonvolatile memory shall retain all setup configurations. After a power failure, the controller shall automatically reboot and return to normal system operation.
3. Integral keypad and digital-display front panel for local setup, including the following:
   a. Blink notice, time adjustable from software.
   b. Ability to log and display relay on-time.
   c. Capability for accepting downloadable firmware so that the latest production features may be added in the future without replacing the module.

F. Relays: Electrically operated, mechanically held single-pole switch, rated at 20 A at 277 V. Short-circuit current rating shall be not less than 5 kA. Control shall be three-wire, 24-V ac.

G. Power Supply: NFPA 70, Class 2, UL listed, sized for connected equipment, plus not less than 20 percent spare capacity. Powered from a dedicated branch circuit of the panelboard that supplies power to the line side of the relays, sized to provide control power for the local panel-mounted relays, bus system, low-voltage inputs, field-installed occupancy sensors, and low-voltage photo sensors.

H. Operator Interface: At the main control unit, provide interface for a tethered connection of a portable PC running MS Windows for configuring all networked lighting control panels using setup software designed for the specified operating system. Include one portable device for initial programming of the system and training of Owner's personnel.

I. Software:
   1. Menu-driven data entry.
   2. Online and offline programming and editing.
   3. Provide for entry of the room or space designation for the load side of each relay.
   4. Monitor and control all relays, showing actual relay state and the name of the automatic actuating control, if any.
   5. Size the software appropriate to the system.

2.3 MANUAL SWITCHES AND PLATES

A. Push-Button Switches: Modular, momentary contact, three wire, for operating one or more relays and to override automatic controls.
   1. Match color and style specified in Section 262726 "Wiring Devices."
   2. Integral green LED pilot light to indicate when circuit is on.

B. Wall Plates: Single and multigang plates as specified in Section 262726 "Wiring Devices."

C. Legend: Engraved or permanently silk-screened on wall plate where indicated. Use designations indicated on Drawings.
2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Class 2 Power Source: Not smaller than No. 12 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cables: Multiconductor cable with copper conductors not smaller than No. 22 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Digital and Multiplexed Signal Cables: Unshielded, twisted-pair cable with copper conductors, complying with TIA/EIA-568-B.2, Category 6 for horizontal copper cable and with Section 271500 "Communications Horizontal Cabling."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panels according to NECA 407.

B. Examine panels before installation. Reject panels that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panels for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRING INSTALLATION

A. Comply with NECA 1.

   1. Install plenum cable in environmental air spaces, including plenum ceilings.
   2. Comply with requirements for cable trays specified in Section 260536 "Cable Trays for Electrical Systems."
   3. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
3.3 PANEL INSTALLATION

A. Comply with NECA 1.

B. Install panels and accessories according to NECA 407.

C. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

D. Mount top of trim 74 inches above finished floor unless otherwise indicated.

E. Mount panel cabinet plumb and rigid without distortion of box.

F. Install filler plates in unused spaces.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

C. Create a directory to indicate loads served by each relay; incorporate Owner's final room designations. Obtain approval before installing. Use a PC or typewriter to create directory; handwritten directories are unacceptable.

D. Lighting Control Panel Nameplates: Label each panel with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

B. Lighting control panel will be considered defective if it does not pass tests and inspections.

3.6 STARTUP SERVICE

A. Perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Confirm correct communications wiring, initiate communications between panels, and program the lighting control system according to approved configuration schedules, time-of-day schedules, and input override assignments.
3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.8 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
   1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain the control unit and operator interface.

END OF SECTION 260943
SECTION 262200
LOW-VOLTAGE TRANSFORMERS

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 types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:
   1. Distribution transformers.
   2. Buck-boost transformers.

1.3 ACTION SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
      b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Qualification Data: For testing agency.

C. Source quality-control test reports.
D. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

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 IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.8 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Challenger Electrical Equipment Corp.; a division of Eaton Corp.
   2. Eaton Electrical Inc.; Cutler-Hammer Products.
   5. Square D; Schneider Electric.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.
   1. Internal Coil Connections: Brazed or pressure type.
   2. Coil Material: Aluminum.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Provide transformers that are constructed to withstand seismic forces specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

C. Cores: One leg per phase.

D. Enclosure: Ventilated, NEMA 250, Type 2.
   1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

E. Taps for Transformers Smaller Than 3 kVA: None.

F. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

G. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.

H. Energy Efficiency for Transformers Rated 15 kVA and Larger:
   1. Complying with NEMA TP 1, Class 1 efficiency levels.
   2. Tested according to NEMA TP 2.

I. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.
   1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
   2. Indicate value of K-factor on transformer nameplate.

J. Wall Brackets: Manufacturer's standard brackets.

K. KLow-Sound-Level Requirements: NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.4 BUCK-BOOST TRANSFORMERS

A. Description: Self-cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer. Transformers shall comply with NEMA ST 1 and shall be listed and labeled as complying with UL 506 or UL 1561.

B. Enclosure: Ventilated, NEMA 250, Type 2.
   1. Finish Color: Gray.
2.5 IDENTIFICATION DEVICES
   A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.6 SOURCE QUALITY CONTROL
   A. Test and inspect transformers according to IEEE C57.12.91.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.
   B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
   C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
   D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
   E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
   A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.
      1. Brace wall-mounting transformers as specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
   B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions, seismic codes applicable to Project, and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

3.3 CONNECTIONS
   A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
   B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL
3.5 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262200
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. Lighting and appliance branch-circuit panelboards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Include evidence of NRTL listing for series rating of installed devices.
   6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   7. Include wiring diagrams for power, signal, and control wiring (shunt trip breakers).

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

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. Keys: Two spares for each type of panelboard cabinet lock.
1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

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

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.8 PROJECT CONDITIONS

A. Environmental Limitations:
   1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
      a. Ambient Temperature: Not exceeding 23 deg F (minus 5 deg C) to plus 104 deg F (plus 40 deg C).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
   1. Ambient temperatures within limits specified.
   2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
   1. Notify Owner no fewer than two days in advance of proposed interruption of electric service.
   2. Do not proceed with interruption of electric service without Owner's written permission.
   3. Comply with NFPA 70E.
1.9 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Surface-mounted cabinets.
   1. Rated for environmental conditions at installed location.
      a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
   2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
   3. Finishes:
      a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

B. Phase, Neutral, and Ground Buses:
   2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

C. Conductor Connectors: Suitable for use with conductor material and sizes.
   2. Main and Neutral Lugs: Mechanical type.
   3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
   4. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

D. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

E. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.
2.2 PERFORMANCE REQUIREMENTS

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

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating to meet available fault currents.
   2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
   3. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
      a. Standard frame sizes, trip ratings, and number of poles.
      b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
      c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
      d. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
      e. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

C. Mount top of trim 72” above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

H. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply,
      feeder, and control circuit.
   2. Test continuity of each circuit.

B. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate
      compliance; otherwise, replace with new units and retest.

C. Panelboards will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies
   panelboards included and that describes scanning results. Include notation of
   deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as
   recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573
   "Overcurrent Protective Device Arc-Flash Study."

END OF SECTION 262416
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. Receptacles, receptacles with integral GFCI, and associated device plates.
      2. Weather-resistant receptacles.
      3. Snap switches.
      4. Cord and plug sets.

1.3 DEFINITIONS
   A. EMI: Electromagnetic interference.
   B. GFCI: Ground-fault circuit interrupter.
   C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 ADMINISTRATIVE REQUIREMENTS
   A. Coordination:
      1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
      2. Cord and Plug Sets: Match equipment requirements.

1.5 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For wiring devices to include in all manufacturers'
      packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following
      manufacturers' names are used in other Part 2 articles:
      1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
      2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).

   B. Source Limitations: Obtain each type of wiring device and associated wall plate from
      single source from single manufacturer.
2.2 GENERAL WIRING-DEVICE REQUIREMENTS

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

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; 5351 (single), CR5362 (duplex).
      b. Hubbell; HBL5351 (single), HBL5352 (duplex).
      c. Leviton; 5891 (single), 5352 (duplex).
      d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

A. General Description:
   1. Straight blade, feed-through type.
   2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
   3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; VGF20.
      b. Hubbell; GFR5352L.
      c. Pass & Seymour; 2095.
      d. Leviton; 7590.

2.5 CORD AND PLUG SETS

A. Description:
   1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
   2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
2.6 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:
      Single Pole:
      1) Cooper; AH1221.
      2) Hubbell; HBL1221.
      3) Leviton; 1221-2.
      4) Pass & Seymour; CSB20AC1.
      Three Way:
      5) Cooper; AH1223.
      6) Hubbell; HBL1223.
      7) Leviton; 1223-2.
      8) Pass & Seymour; CSB20AC3.
      Four Way:
      9) Cooper; AH1224.
      10) Hubbell; HBL1224.
      11) Leviton; 1224-2.
      12) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; AH1221PL for 120 and 277 V.
      b. Hubbell; HBL1201PL for 120 and 277 V.
      c. Leviton; 1221-LH1.
      d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.
   2. Description: Single pole, with neon-lighted handle, illuminated when switch is "on."

2.7 PENDANT CORD-CONNECTOR DEVICES

A. Description:
   1. Matching, locking-type plug and receptacle body connector.
   2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
   4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.8 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.
   4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.9 FINISHES

A. Device Color:
   1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
   2. Isolated-Ground Receptacles: As specified above, with orange triangle on face.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.

3.2 GFCI RECEPTACLES
A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION
A. Comply with Section 260553 "Identification for Electrical Systems."
B. Identify each receptacle with panelboard identification and circuit number. Use durable machine printed labels.

3.4 FIELD QUALITY CONTROL
A. Tests for Convenience Receptacles:
   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   3. Using the test plug, verify that the device and its outlet box are securely mounted.

B. Wiring device will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 262726
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in enclosed switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
   a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
   b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.


4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.

5. Coordination charts and tables and related data.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.

2. Current-limitation curves for fuses with current-limiting characteristics.

3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.

4. Coordination charts and tables and related data.

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. Fuses & Fuse Reducers: See drawings for spare fuse requirements where disconnects are to be used for different pieces of equipment each semester.
1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

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

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

1.7 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.8 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Bussmann, Inc.
   2. Edison Fuse, Inc.
   3. Ferraz Shawmut, Inc.
   4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:
   1. Motor Branch Circuits: Class RK5, time delay.
   2. Other Branch Circuits: Class RK5, time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder, unless fused switch will be used by different pieces of equipment each semester.

END OF SECTION 262813
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Include evidence of NRTL listing for series rating of installed devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
   6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.
1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fuse Pullers: Two for each size and type.
2. Fuse Reducers: Three for each size and type.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

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

D. Comply with NFPA 70.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Construction Manager's written permission.
4. Comply with NFPA 70E.
1.10 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.


D. Features and Accessories:
   1. Standard frame sizes, trip ratings, and number of poles.
   2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
   3. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Outdoor Locations: NEMA 250, Type 3R.
   2. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
   3. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids (Welding Lab): NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
B. Install fuses in fusible devices.
C. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816
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. Interior lighting fixtures, lamps, and ballasts.
   2. Emergency lighting units.
   3. Exit signs.
   4. Lighting fixture supports.

B. Related Sections:
   1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of lighting fixture including dimensions.
   2. Emergency lighting units including battery and charger.
   3. Ballast, including BF.
   5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.

B. Installation instructions.
1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Fluorescent-fixture-mounted, emergency battery pack: One for every 20 emergency lighting unit.
3. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.

1.7 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.9 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings.
2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:
   1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
      a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
      b. UV stabilized.

G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp and ballast characteristics:
      a. "USE ONLY" and include specific lamp type.
      b. Lamp diameter code (T-4, T-5, T-8, T-12, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
      c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
      d. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:
   1. Comply with UL 935 and with ANSI C82.11.
   2. Designed for type and quantity of lamps served.
   3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
   4. Sound Rating: Class A.
   5. Total Harmonic Distortion Rating: Less than 10 percent.
   6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   7. Operating Frequency: 42 kHz or higher.
   8. Lamp Current Crest Factor: 1.7 or less.
   9. BF: as indicated.
10. Power Factor: 0.95 or higher.
11. NEMA Premium Ballast labelled
12. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

B. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.

C. Electronic Programmed-Start Ballasts for T8 Lamps: Comply with ANSI C82.11 and the following:
   1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
   2. Automatic lamp starting after lamp replacement.

D. Ballasts for Bi-Level Controlled Lighting Fixtures: Electronic type.
   1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.
      a. High-Level Operation: 100 percent of rated lamp lumens.
      b. Low-Level Operation: 30 percent of rated lamp lumens.
   2. Ballast shall provide equal current to each lamp in each operating mode.
   3. Compatibility: Certified by manufacturer for use with specific bi-level control system and lamp type indicated.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Automatic lamp starting after lamp replacement.
   3. Sound Rating: Class A.
   4. Total Harmonic Distortion Rating: Less than 20 percent.
   5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   6. Operating Frequency: 20 kHz or higher.
   7. Lamp Current Crest Factor: 1.7 or less.
   8. BF: 0.95 or higher unless otherwise indicated.
   9. Power Factor: 0.95 or higher.
   10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.5 EMERGENCY FLUORESCENT POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
   1. Emergency Connection: Operate two fluorescent lamp(s) continuously at an output of 700 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
   2. Nightlight Connection: Operate one fluorescent lamp continuously.
   3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
      a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
6. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.6 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.7 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
   a. Battery: Sealed, maintenance-free, nickel-cadmium type.
   b. Charger: Fully automatic, solid-state type with sealed transfer relay.
   c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
   d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
   e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
   f. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
2.8 FLUORESCENT LAMPS

A. T8 rapid-start lamps, rated 28 W maximum, nominal length of 48 inches (1220 mm), 2800 initial lumens (minimum), CRI 80 (minimum), color temperature 3500 K, and average rated life 30,000 hours unless otherwise indicated.

B. T5HO rapid-start, high-output lamps, rated 54 W maximum, nominal length of 45.2 inches (1150 mm), 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 3500 K, and average rated life of 30,000 hours unless otherwise indicated.

2.9 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:
   1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
   2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
   1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
   2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
   3. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

3.4 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 6 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to one visit to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.

END OF SECTION 265100
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. UTP cabling - Existing to be relocated, terminated and tested
   2. Cable connecting hardware, patch panels, and cross-connects.
   3. Telecommunications outlet/connectors.
   4. Cabling system identification products.

1.3 DEFINITIONS


B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

D. EMI: Electromagnetic interference.

E. IDC: Insulation displacement connector.

F. LAN: Local area network.

G. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

H. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.

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

C. Grounding: Comply with J-STD-607-A.

2.2 UTP CABLE

A. Cable is existing and to be relocated.

2.3 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ADC.
   3. Belden Inc.
   4. Dynacom Inc.
   5. Hubbell Premise Wiring.
   6. Leviton Commercial Networks Division.
   7. Molex Premise Networks; a division of Molex, Inc.
   8. Panduit Corp.
   10. Tyco Electronics Corporation; AMP Products.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
2.4 TELECOMMUNICATIONS OUTLET/CONNECTORS


B. Workstation Outlets: Four-port-connector assemblies mounted in single faceplate.
   1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
   2. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.

2.5 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Section 260553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Install cables in pathways and bridle rings except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used.

B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:
   1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
   2. Install lacing bars and distribution spools.
   3. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:
   2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
   3. Install 110-style IDC termination hardware unless otherwise indicated.
   4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
   5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
C. UTP Cable Installation:
2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.

D. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1524 mm) apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA-569-B for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).
3. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
4. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.3 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-B, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.4 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
   1. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Cable and Wire Identification:
   1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.

3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).

4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
   a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
   b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

6. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

C. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.
   1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
   3. UTP Performance Tests:
      a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:
         1) Wire map.
         2) Length (physical vs. electrical, and length requirements).
         3) Insertion loss.
         4) Near-end crosstalk (NEXT) loss.
         5) Power sum near-end crosstalk (PSNEXT) loss.
         6) Equal-level far-end crosstalk (ELFEXT).
         7) Power sum equal-level far-end crosstalk (PSELFEXT).
         8) Return loss.
         9) Propagation delay.
        10) Delay skew.
   4. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.
      a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
b. **Data Tests:** These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 271500
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. System smoke detectors.
      2. Heat detectors.
      4. Addressable interface device.

1.3 DEFINITIONS
   A. EMT: Electrical Metallic Tubing.
   B. FACP: Fire Alarm Control Panel.
   C. HLI: High Level Interface.
   E. PC: Personal computer.
   F. VESDA: Very Early Smoke-Detection Apparatus.

1.4 ACTION SUBMITTALS
   A. Product Data: For each type of product, including furnished options and accessories.
      1. Include construction details, material descriptions, dimensions, profiles, and finishes.
      2. Include rated capacities, operating characteristics, and electrical characteristics.
   B. Shop Drawings: For fire-alarm system.
      1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
      2. Include plans, elevations, sections, details, and attachments to other work.
      3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
      4. Detail assembly and support requirements.
      5. Include voltage drop calculations for notification-appliance circuits.
      6. Include input/output matrix.
7. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
8. Include performance parameters and installation details for each detector.
9. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

C. General Submittal Requirements:
1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:
   a. Trained and certified by manufacturer in fire-alarm system design.
   b. NICET-certified, fire-alarm technician; Level III minimum.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.
B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:
      a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
      b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
      c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
      d. Riser diagram.
      e. Device addresses.
      f. Record copy of site-specific software.
      g. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
         1) Equipment tested.
         2) Frequency of testing of installed components.
         3) Frequency of inspection of installed components.
         4) Requirements and recommendations related to results of maintenance.
         5) Manufacturer's user training manuals.

B. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

1.8 PROJECT CONDITIONS

A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.

B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
   1. Notify Owner no fewer than seven days in advance of proposed interruption of fire-alarm service.
   2. Do not proceed with interruption of fire-alarm service without Construction Manager's written permission.

C. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.9 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
   1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing Notifier fire alarm system.
Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Noncoded, addressable system, with multiplexed signal transmission and audible/strobe evacuation.
C. Automatic sensitivity control of certain smoke detectors.
D. All components provided shall be listed for use with the selected system.
E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEM SMOKE DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide products listed for existing fire alarm system.

B. General Requirements for System Smoke Detectors:
1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type, indicating detector has operated.
7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
   a. Multiple levels of detection sensitivity for each sensor.

C. Photoelectric Smoke Detectors:
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

2.3 HEAT DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide products listed for existing fire alarm system.
B. General Requirements for Heat Detectors: Comply with UL 521.
   1. Temperature sensors shall test for and communicate the sensitivity range of the device.

C. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.
   1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.4 NOTIFICATION APPLIANCES

A. Manufacturers: Subject to compliance with requirements, provide products listed for existing fire alarm system and matching existing notification appliances.

B. General Requirements for Notification Appliances: Individually addressed, connected to a signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.

C. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
   1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

D. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
   1. Rated Light Output:
      a. 15/30/75/110 cd, selectable in the field.
   2. Mounting: Wall mounted unless otherwise indicated.
   3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
   4. Flashing shall be in a temporal pattern, synchronized with other units.
   5. Strobe Leads: Factory connected to screw terminals.

2.5 ADDRESSABLE INTERFACE DEVICE

A. General:
   1. Include address-setting means on the module.
   2. Store an internal identifying code for control panel use to identify the module type.
   3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
   1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
   1. Devices placed in service before all other trades have completed cleanup shall be replaced.
   2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
   1. configuration without degrading the performance of either system.

C. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

3.3 PATHWAYS

A. Pathways shall be installed in EMT.

B. Junction box covers shall be painted red.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.
3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Perform the following tests and inspections:
   1. Visual Inspection: Conduct visual inspection prior to testing.
      a. Inspection shall be based on completed record Drawings and system
         documentation that is required by the "Completion Documents, Preparation"
         table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
      b. Comply with the "Visual Inspection Frequencies" table in the "Inspection"
         section of the "Inspection, Testing and Maintenance" chapter in NFPA 72;
         retain the "Initial/Reacceptance" column and list only the installed
         components.
   2. System Testing: Comply with the "Test Methods" table in the "Testing" section
      of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   3. Test audible appliances for the public operating mode according to manufacturer's
      written instructions. Perform the test using a portable sound-level meter
      complying with Type 2 requirements in ANSI S1.4.
   4. Test audible appliances for the private operating mode according to
      manufacturer's written instructions.
   5. Test visible appliances for the public operating mode according to manufacturer's
      written instructions.
   6. Factory-authorized service representative shall prepare the "Fire Alarm System
      Record of Completion" in the "Documentation" section of the "Fundamentals"
      chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records"
      section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of
   added or replaced devices and appliances.

D. Fire-alarm system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly,
   monthly, quarterly, and semiannual periods. Use forms developed for initial tests and
   inspections.

G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-
   alarm system complying with visual and testing inspection requirements in NFPA 72.
   Use forms developed for initial tests and inspections.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111
SECTION 31 10 00  
SITE CLEARING  

PART 1 - GENERAL  

1.01 SUMMARY  
A. Section Includes:  
   1. Removing existing vegetation.  
   2. Clearing and grubbing.  
   3. Stripping and stockpiling topsoil.  
   4. Removing above- and below-grade site improvements.  
   5. Disconnecting, capping or sealing site utilities.  
   6. Temporary erosion- and sedimentation-control measures.  

1.02 STANDARD REFERENCE  
A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans and specifications are to be used in tandem; where one conflicts with the other, the most costly and higher quality requirement will govern.  
B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".  
C. New Hampshire Department of Environmental Services, Alteration of Terrain design standards, latest revision.  
D. EPA, Construction General Permit, Notice of Intent and Storm Water Pollution Prevention Plan.  

1.03 MATERIAL OWNERSHIP  
A. Except for stripped topsoil and other soil materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials such as cut trees not to be replanted, stumps, pavement, concrete, brick etc..... shall become Contractor's property and shall be removed from Project site.  

1.04 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. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated on Contract Drawings and as directed by the Owner.

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 and EPA Notice of Intent period of 14 days has passed.

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

2.01 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

3.01 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.02 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.

3.03 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 Construction Manager not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Construction Manager's written permission.

C. Removal of underground utilities is included in Division 33 Sections.

3.04 CLEARING AND GRUBBING

A. Remove obstructions and other vegetation to permit installation of new construction.

1. Remove stumps, roots, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.

2. Use only hand methods for grubbing within protection zones.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.
3.05 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil as needed in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.06 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.07 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.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses.

2. Excavating and backfilling for buildings and structures.

3. Drainage course for concrete slabs-on-grade.

4. Subbase course for concrete walks and pavements.

5. Subbase course and base course for asphalt paving.


1.02 STANDARD REFERENCE

A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans shall govern over technical specifications.

B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".

1.03 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. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil from on-site and imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
F. 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.

G. Fill: Soil materials used to raise existing grades.

H. 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.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

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.

1.04 QUALITY ASSURANCE

   A. Pre-excavation Conference: A site meeting shall be conducted with the Site Contractor, Engineer, Architect and Owner to review materials.

1.05 PROJECT CONDITIONS

   A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

   B. Do not commence earth moving operations until plant-protection measures specified on the Contract drawings and Division 31 Section “Site Clearing” are in place.

PART 2 - PRODUCTS

2.01 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 Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a
combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any
dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT
according to ASTM D 2487, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to
AASHTO M 145, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of
optimum moisture content at time of compaction.

D. Subbase Material (Structural Borrow): Naturally or artificially graded mixture of natural or
crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 60 -
100 percent passing a 1-inch (25-mm) sieve and not more than 3-10 percent passing a No. 200
(0.075-mm) sieve. Equivalent to NH DOT Item No. 304.33. Refer to Geotechnical Report for
specification.

E. Base Course:

1. Driveway/Parking Areas: Naturally or artificially graded mixture of natural or crushed
gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 85
percent passing a 3-inch sieve and not more than 5 percent passing a No. 200 (0.075-mm)
sieve. Equivalent to NH DOT Item No. 304.5.

2. Walks and Slabs: Naturally or artificially graded mixture of natural or crushed gravel,
crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent
passing a 2-1/2-inch sieve and not more than 12 percent passing a No. 200 (0.075-mm)
sieve. Equivalent to NH DOT Item No. 304.3.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed
stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 2-1/2-
inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
Equivalent to NH DOT Item No. 304.3.

G. 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
(25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve. Equivalent to
NH DOT Item No. 304.2.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed
gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch
(37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve. Equivalent to NH DOT
Item No. 304.4.

I. Sand: Naturally or artificially graded mixture of natural bank or processed material
ASTM D 2940; with at least 70- 100 percent passing a #4 sieve and not more than 12 percent
passing a No. 200 (0.075-mm) sieve. Equivalent to NH DOT Item No. 304.1.

J. Pea Stone: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed
gravel; ASTM D 448; coarse-aggregate grading Size 89; with 100 percent passing a 1/2-inch
(12.5-mm) sieve and 0 to 5 percent passing a No. 50 (2.36-mm) sieve.
2.02 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) 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 (750 mm) deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.01 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.

3.02 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.

3.03 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
3.04 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.05 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit.
   1. Clearance: 12 inches (300 mm) each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
   1. Excavate trenches 12 inches deeper than elevation required in rock or other unyielding bearing material, 6-12 inches deeper elsewhere, to allow for bedding course. Refer to Contract documents.

3.06 SUBGRADE INSPECTION

A. 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.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.07 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 (17.2 MPa), may be used when approved by Geo-tech and Architect.
   1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.

3.08 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

   2. Stockpile excess soil as directed by Owner.
3.09  UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 033 Section "Cast-in-Place Concrete and Miscellaneous Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 033 Section "Cast-in-Place Concrete or Miscellaneous Cast-in-Place Concrete."

E. Place and compact initial backfill of sand material, to a height of 12 inches (300 mm) over the pipe or conduit.
   1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.010  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. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
   4. Under building slabs, use engineered fill.
   5. Under footings and foundations, use engineered fill.
3.011 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.

3.012 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) 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, Method D:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent modified proctor.

2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 90 percent modified proctor.

3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent modified proctor.

4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent modified proctor.

3.013 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 (25 mm).

2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.014 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 (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) 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, Method D.

3.015 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
   1. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
   2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.016 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections. See Section 01 40 00 “Quality Requirements”.

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.

3.017 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.

3.018 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soils and dispose of them on Owner’s property in an agreed upon area.

B. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Section includes construction dewatering.

1.02 STANDARD REFERENCE

A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans and specifications are to be used in tandem; where one conflicts with the other, the most costly and higher quality requirement will govern.

B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".

C. New Hampshire Department of Environmental Services, Alteration of Terrain design standards, latest revision.

D. EPA-Construction General Permit, Notice of Intent and Storm Water Pollution Prevention Plan.

1.03 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1.04 SUBMITTALS

A. Shop Drawings: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, discharge lines, piezometers, and flow-measuring devices; and means of discharge, control of sediment, and disposal of water.

B. Delegated-Design Submittal: For dewatering system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.
B. Preinstallation Conference: Conduct conference at the project site with Geotechnical Engineer, Architect and Civil Engineer.

1.06 PROJECT CONDITIONS

A. Survey Work: Clearly identify benchmarks and record existing elevations.

1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide temporary grading to facilitate dewatering and control of surface water.

B. Monitor dewatering systems continuously.

C. Protect and maintain temporary erosion and sedimentation controls, which are specified on the Contract Drawings and in Division 31 Section "Site Clearing" during dewatering operations.

D. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.

2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

E. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

F. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

G. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.

1. Maintain piezometric water level a minimum of 24 inches (600 mm) below surface of excavation.
H. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches (900 mm) below overlying construction.

END OF SECTION
SECTION 31 25 13

EROSION CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Temporary erosion- and sedimentation-control measures.

1.03 STANDARD REFERENCE

A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans and specifications are to be used in tandem; where one conflicts with the other, the most costly and higher quality requirement will govern.

B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".


F. EPA-NPDES’s-Construction General Permit Rules and Regulations, 2012

1.04 DEFINITIONS

A. NHDES: New Hampshire Department of Environmental Services.

B. EPA: Environmental Protection Agency.

C. NPDES: National Pollution Discharge Elimination System.
D. SWPPP: Storm Water Pollution Prevention Plan.
E. CGP: Construction General Permit.
F. NOI: Notice of Intent.
G. NOT: Notice of Termination.

1.05 SUBMITTALS

A. SWPPP and NOI: The Contractor must review the SWPPP prepared for the Owner and file an NOI 14 days prior to the start of construction per the guidelines set forth in the EPA/CGP and NHDOT reference standards, Section 645.

1. The CONTRACTOR shall make any changes to the active construction plan and Amendments to the SWPPP as needed.
2. The CONTRACTOR will be required to keep up the SWPPP during the construction process.

B. Product Data: For each type of product indicated.

1. Silt Sock.
2. Silt Fence.
4. Temporary Seed, Muleh, Fertilizer Mixtures.
5. Dust Control Products.

1.06 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

B. Soil erosion and sediment control measures shall be implemented in accordance with the requirements and procedures outlined in this specification, contract drawings and documents, the state standards or guidelines for soil erosion and sediment control and all regulatory authorities having jurisdiction. Where conflicts between requirements exist, the more restrictive rules shall govern.

C. Temporary control provisions shall be coordinated with permanent erosion control features to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post construction period.

D. Soil erosion and sediment control measures shall at all times be satisfactory to the Project Engineer. Project Engineer will inform the Contractor of unsatisfactory construction procedures and operations if observed. If the unsatisfactory construction procedures and operations are not responded to and corrected within 48 hours, the Project Engineer may suspend the performance of any or all other construction until the unsatisfactory condition has been corrected. Such suspension shall not be the basis of any claim by the Contractor for additional compensation nor for an extension of time to complete the work. Any complaints,
fines, etc. relating to ineffective erosion control, shall be the sole responsibility of the Contractor.

E. The Contractor shall inspect all soil erosion and sediment control measures at least at the beginning and end of each day to ascertain that all devices are functioning properly during construction. Maintenance of all soil erosion and sediment control measures on the project site shall be the responsibility of the Contractor until the project is 100% complete, and until the permanent soil erosion controls are established and in proper working condition.

F. The Contractor shall protect adjacent properties and watercourses from soil erosion and sediment damage throughout construction.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The Contractor shall provide all of the necessary materials to perform the work.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Implement all necessary erosion and sediment control devices required.

3.02 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 and the SWPPP included in this contract.

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.

3.03 PERFORMANCE AND GENERAL REQUIREMENTS

A. The Contractor shall comply with and implement the Stormwater Pollution Prevention Plan.
B. Review the soil erosion and sediment control drawings as they apply to current site conditions. Any deviation from the drawings must be shown as an Amendment to the SWPPP prior to commencing that work.

C. All soil sediment and erosion control devices shall be in place prior to any earthwork construction, in their proper sequence, and maintained until permanent protection is established.

D. The limit of the area of any earthwork operations in progress shall be commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding and other such permanent control measures current and in accordance with the accepted schedule for construction phasing. Should seasonal limitations make such coordination unrealistic, as determined by the Project Engineer, temporary erosion control measures shall be provided immediately by the Contractor at no expense to the Owner.

E. Temporary erosion control measures shall be used to correct conditions, which develop during construction that are needed prior to installation of permanent control features, or that are temporarily needed to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

F. The Contractor shall incorporate all permanent erosion control features into the project at the earliest practical time to minimize the need for temporary controls.

G. Any mud or debris tracked on driveways, parking areas shall be cleaned up immediately.

H. Any disturbed or stockpiled areas that will be left exposed more than 14 days according to NHDES or NPDES General Stormwater Permits, and not subject to construction traffic, shall immediately receive a temporary seeding. Mulch/straw shall be used if the season prevents the establishment of a temporary cover. Disturbed areas shall be limed and fertilized prior to temporary seeding.

I. Permanent vegetation shall be established as specified on all exposed areas within 14 days or less according to NHDES & NPDES General Stormwater Permits after final grading. Mulch as necessary for seed protection and establishment. Lime and fertilize seedbed prior to permanent seeding.

J. Cut slopes shall be permanently seeded and mulched as the excavation proceeds to the extent considered desirable and practical. Slopes that erode easily shall be temporarily seeded and mulched.

K. Discharge from de-watering operations for the excavated areas shall not be directed to surface waters without first properly removing the suspended sediment through filtration and/or settlement. The Contractor shall provide procedure of dewatering activities within the SWPPP.

L. The quantity of siltation devices are to be installed will be affected by the actual conditions that occur during the construction of the project. Siltation devices shall be installed at locations shown on the drawings and any additional locations necessary for proper erosion control and
Best Management Practices. The Contractor shall maintain the siltation devices until the project is accepted and shall remove and dispose of all siltation devices and silt accumulations.

M. Soil erosion and sediment control shall include but not be limited to the approved measures. The Contractor shall be responsible for providing all additional measures that may be necessary to accomplish the intent of the drawings.

N. Comply with all other requirements of authorities having jurisdiction.

3.04 DISPOSAL EROSION CONTROL AND SEDIMENT MATERIALS

A. Removal of all siltation devices and silt accumulations shall be legally dispose of them off Owner's property.

3.05 TERMINATION OF EPA’S CGP

A. The Contractor shall file the required NOT upon the completion and acceptable stabilization of all disturbed areas within the Project’s scope of work.

B. The Contractor shall submit the completed SWPPP upon receipt of NOT from EPA, to the Project Engineer.

END OF SECTION
SECTION 32 12 16
ASPHALT PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

   1. Cold milling of existing hot-mix asphalt pavement.
   2. Hot-mix asphalt patching.
   3. Hot-mix asphalt paving.
   4. Hot-mix asphalt paving overlay.

B. Related Sections:

   1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.02 STANDARD REFERENCE

A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans and specifications are to be used in tandem; where one conflicts with the other, the most costly and higher quality requirement will govern.

B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

   1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

   2. Job-Mix Designs: For each job mix proposed for the Work.

B. Material Certificates: For each paving material, from manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the NH DOT.
B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of NH DOT Division 400 for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

C. Preinstallation Conference: Conduct conference at the project site with the Project Engineer and Architect.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).

2. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.

3. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.01 AGGREGATES

A. Coarse Aggregate: AASTO T96, sound; angular crushed stone or crushed gravel. Refer to NH DOT Section 410.2 for specifications.

B. Fine Aggregate: Shall be sharp-edged natural sand or sand prepared from stone, crushed stone, or combinations thereof. Refer to NH DOT Section 410.2 for specifications.

C. Mineral Filler: Shall conform to AASHTO M 17.

2.02 ASPHALT MATERIALS

A. Asphalt Binder: Shall conform to AASHTO M 320. Refer to NH DOT Section 401.2.2 for specifications.

B. Tack Coat: AASHTO M 140 emulsified asphalt or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

2.03 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

B. Pavement-Marking Paint: MPI #32 Alkyd Traffic Marking Paint.


2.04 MIXES
A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by NH DOT and
   complying with the following requirements:
   1. Provide mixes with a history of satisfactory performance in geographical area where
      Project is located.
   2. Base Course: Per NH DOT Section 401.2.4.1
   3. Wearing Course: Per NH DOT Section 401.2.4.

PART 3 - EXECUTION

3.01 EXAMINATION
A. 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.
B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.02 COLD MILLING
A. Clean existing pavement surface of loose and deleterious material immediately before cold
   milling. Remove existing asphalt pavement by cold milling to grades and cross sections
   indicated.
   1. Mill to a depth of 1-1/2 inches (38 mm).

3.03 PATCHING
A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement
   section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300
   mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces
   vertically. Remove excavated material. Recompact existing unbound-aggregate base course
   to form new subgrade.
B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix
   asphalt paving at a rate of 0.02 to 0.05 gal./sq. yd.
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings.
      Remove spillages and clean affected surfaces.
C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch
   and, while still hot, compact flush with adjacent surface.
3.04 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. 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.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.02 to 0.05 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.05 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to 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 minimum temperature of 250 deg F (121 deg C).

2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

C. 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.

3.06 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 (150 mm).

3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).

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."

3.07 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 (85 deg C).

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 nor 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.

3.08 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch (13 mm).

2. Wearing Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch (6 mm).

2. Surface Course: 1/8 inch (3 mm).
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.09 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Replace and compact hot-mix asphalt where core tests were taken.

C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.010 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION
SECTION 323113

CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

2. Gates: swing.

1.2 STANDARD REFERENCE

A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans and specifications are to be used in tandem; where one conflicts with the other, the most costly and higher quality requirement will govern.

B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations, components, materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

C. Maintenance Data: For polymer finishes.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

2.0 PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: Height indicated on Drawings. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:
1. Steel Wire Fabric: Polymer-coated wire with a diameter of 0.192 inch (4.88 mm).
   a. Mesh Size: 2-1/8 inches (54 mm).
   b. Aluminum Coating: ASTM A 491, Type I.
   c. Metallic (Zinc) Coating: ASTM A 392, Type II.
   d. Zn-5-Al-MM Aluminum-Mischmetal Alloy Coating: ASTM F 1345, Type III.
   e. Polymer Coating: ASTM D 668, Class I over metallic-coated steel wire.

   1) Color: As selected by Owner/Architect from manufacturer's full range, complying with ASTM F 934.

2. Selvage: Knuckled at both selvages.

2.2 FENCE AND GATING

A. Posts and Rails: Round:
   1. Fence Height: 10 feet.
   3. Tube or Pipe Diameter and Thickness: According to ASTM F 761.
   5. Gate: Comply with ASTM F 654 and the following:

      a. Type: I, single swing frame tubing.
      b. Fabric Height: 2 inches (50 mm) less than adjacent fence height.
      c. Leaf Width: 36 inches (914 mm).

   6. Hardware: Latches permitting operation from both sides of gate.
   7. Metallic-Coated Steel: Posts, rails, and frames protected with an external coating of not less than 0.6 oz. of zinc/sq. ft. (183 g of zinc/sq. m), a chromate conversion coating, and a clear, verifiable polymer film; with an internal protective coating of not less than 0.6 oz. of zinc/sq. ft. (183 g of zinc/sq. m) or 81 percent, not less than 0.3-mil- (0.0076-mm-) thick, zinc pigmented coating.

2.3 TENSION WIRE

A. General: Provide horizontal tension wire at bottom of fence fabric.

B. Aluminum Wire: 0.192-inch- (4.88-mm-) diameter tension wire, mill finished, complying with ASTM B 211 (ASTM B211M), Alloy 6061-T94 with 50,000-psi (344-MPa) minimum tensile strength.

2.4 FITTINGS

A. General: Comply with ASTM F 626.

B. Finish:
1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. (366 g/sq. m) zinc.

2.5 CAST-IN-PLACE CONCRETE

A. Materials: See Division 3 Cast In-Place Concrete-03300.

2.6 FENCE GROUNDING

A. Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
   1. Material above Finished Grade: Copper.
   2. Material on or below Finished Grade: Copper.
   3. Bonding Jumpers: Braided copper tape, 1 inch (25 mm) wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.

B. Connectors and Grounding Rods: Comply with UL 467.

2.7 POLYMER FINISHES

A. Supplemental Color Coating: Provide fence components with polymer coating.
B. Metallic-Coated Steel Tension Wire: PVC-coated wire complying with ASTM F 1664, Class 1.
C. Metallic-Coated Steel/Aluminum Framing and Fittings: Comply with ASTM F 626 and ASTM F 1043 for polymer coating applied to exterior surfaces and, except inside cap shapes, to exposed interior surfaces.
D. Color: Match chain-link fabric or as directed by Owner/Architect from manufacturer's full range, complying with ASTM F 934.

3.0 EXECUTION

3.1 INSTALLATION

A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
   1. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
D. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment.

E. Line Posts: Space line posts uniformly along lines that do not exceed 10 feet (3 m) o.c.

F. Post Bracing and Intermediate Rails: Install according to ASTM F 567. Install braces at end and gate posts and at both sides of corner and pull posts.

G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing.

H. Top Rail: Install according to ASTM F 567.

I. Bottom Rails: Install, spanning between posts.

J. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1 inch (25.4 mm) between finish grade or surface and bottom selvage, unless otherwise indicated.

K. Tie Wires: Attach wire per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.

M. Privacy Slats: Install slats in direction indicated, securely locked in place.

3.2 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.3 GROUNDING AND BONDING

A. Fence Grounding: Install at maximum intervals of 150 feet.

B. Fences within 100 Feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 150 feet.

1. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches (150 mm) below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location.

C. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

1. Connections: Make connections so possibility of galvanic action or electrolysis is minimized.
D. Bonding to Lightning Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning protection down conductor or lightning protection grounding conductor complying with NFPA 780.

3.4 FIELD QUALITY CONTROL

A. Grounding-Resistance Testing: Engage a qualified independent testing agency to perform field quality-control testing.

END OF SECTION 02821
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Design and construction of segmental retaining walls as indicated in Contract Documents.
   2. Engineering design of retaining wall, geosynthetic reinforcement, backfill, and subsurface drainage shall be performed by either the Contractor, by the retaining wall unit manufacturer, or by a professional engineer licensed in the State where the project is located and employed by either the Contractor or the manufacturer.

B. Related Sections:
   1. Division Division 31 Section "Site Clearing", "Earth Moving" and "Erosion Control"

1.2 STANDARD REFERENCE

A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans shall govern over technical specifications.

B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".


F. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2000a.


1.3 SUBMITTALS

A. Submit design submittal at least 2 weeks prior to start of installation; do not begin work until design submittal has been approved by Project Engineer.

B. Certifications: Submit manufacturers' certifications stating that the retaining wall units and geosynthetic reinforcement to be furnished meet the requirements of this specification.

C. Design Submittal: Submit two copies, signed and sealed by a professional Civil Engineer (P.E.) (herein referred to as the Wall Design Engineer) experienced in segmental retaining wall design and licensed in the state where the wall is to be built; include:

1. Detailed design calculations showing compliance with specified design criteria.
2. Wall Design Drawings showing all information necessary for installation; i.e. without the necessity to refer to these contract documents in the field.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in the installation of segmental retaining walls and employing a field construction supervisor with demonstrated experience and qualified to direct all work at the site.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store and handle materials in accordance with manufacturer’s recommendations.

B. Protect materials from damage, do not install damage materials.

C. Keep stored materials reasonably clean, prevent mud, wet concrete, epoxies and like materials that may affix themselves from coming in contact with materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:
   a. Licensee of VERSA-LOK Retaining Wall Systems; 6348 Highway 36, Suite 1, Oakdale, MN 55128. ASD. Tel: (651) 770-3166 or (800) 770-4525. Fax: (651) 770-4089.
B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01.

2.2 SEGMENTAL RETAINING WALLS

A. Design and construct segmental retaining walls in locations indicated:

2. Design walls for external stability against sliding and overturning, internal stability, and facial stability of the reinforced soil mass in accordance with acceptable engineering practice, the contract documents, and in accordance with the NCMA Design Manual for Segmental Retaining Walls, using the recommended minimum factors of safety.
3. Vertical spacing between geogrid layers may vary, but may not exceed 24 inches (610 mm).
4. Design geosynthetic reinforcement so that there is 100 percent continuous coverage parallel to the wall face without gaps between horizontally adjacent layers of geosynthetic.
5. Provide leveling pad extending at least 6 inches (150 mm) beyond the toe and heel of the lowermost unit and at least 6 inches (150 mm) thick unless concrete is used, which may be 3 inches (75 mm) thick.
6. Provide subdrainage if required by the design; obtain Architect/Engineer's approval of drainage outlet location.

B. Soil Parameters: Contractor is responsible for determining soil type classifications at the project site for use in preparation of the wall design.

C. If the actual soil conditions encountered during construction differ from those assumed for the design, the Wall Design Engineer shall review and modify the design if required.

2.3 MATERIALS

A. Retaining Wall Units:

1. VERSA-LOK Retaining Wall Units; machine formed, portland cement concrete blocks specifically designed for retaining wall applications and complying with ASTM C 1372.
   a. Unit Height: 6 inches (150 mm).
   b. Face Width: 16 inches (406 mm) ("Standard").
   c. Face Width: 12 inches (305 mm) ("Accent").
   d. Face Width: 8 inches (203 mm) ("Cobble").
   e. Face Width: 8, 12, and 16 inches (203, 305, and 406 mm), modular sizes for random pattern ("Mosaic").
f. Finish: Split face, textured surface on all vertical surfaces that will be exposed after completion of wall, including exposed sides and backs of units.

g. Design: Straight geometry face, solid through full depth of unit, interlocked with connection pins, with setback to provide 8:1 vertical to horizontal batter (7 degree cant from vertical).

h. Color: ____________.

i. Coursing: Overlap units on each successive course.

j. Corners: Overlap units at corners so that walls meeting at corner are interlocked and continuous; mitered corners prohibited.

k. Depth (Front face to Rear) to Height Ratio: 2:1, minimum.

l. Weight of 16 Inch (406 mm) Wide Units (Not Including Aggregate Fill in Unit Voids): 123 psf (600 Kg/sq m) wall face area.

m. Manufacturing Tolerances:
   1) Dimensions: Not more than plus/minus 1/8 inch (3 mm) deviation from specified dimensions, determined in accordance with ASTM C1372; and to provide maximum gap between adjacent units of not more than 1/8 inch (3 mm).
   2) Cracks: No cracks longer than 1/2 inch (12 mm); sound and free of cracks or other defects that would interfere with proper installation or significantly impair strength or permanence of structure.
   3) Chips: No chips visible at a distance of 30 feet (9 m) from wall.

n. Concrete Compressive Strength at 28 Days: 3,000 psi (20.7 MPa); test using specimens conforming to saw-cut coupon provisions of ASTM C 140.

o. Moisture Absorption: 8 percent, by weight, maximum, determined in accordance with ASTM C 1372.

p. Connection Pins: VERSA-Tuff connection pins; glass-reinforced nylon made for use with the retaining wall units supplied.

q. Geosynthetic Reinforcement: Geogrids or geotextiles manufactured as a soil reinforcement element, with demonstrated performance in previous construction of similar size and type; acceptable product to be determined by Wall Design Engineer.

B. Leveling Pad Material:

   1. VERSA-LOK; One of the following:

   a. Compacted sand, gravel, or combination thereof (USCS soil types GP,GW, SP, & SW), 6 inches (150 mm), minimum, in depth.
   b. Lean concrete with compressive strength of 200 to 300 psi (1.4 to 2 MPa), 3 inches (75 mm) thick maximum.
   c. Free Draining Backfill material shall be granular, well draining sand or stone and shall be placed to a minimum of 12” width behind the back of the wall and shall extend vertically from the Leveling Pad to an elevation 16” below the top of wall.
   d. Backfill material shall be approved by the geotechnical engineer. Site excavated soils may be used if approved unless otherwise specified in the drawings.
   e. Non-woven geotextile cloth shall be placed between the Free Draining Backfill and retained soil.
   f. Where additional fill is needed, contractor shall submit sample and specifications to Geotechnical Engineer for approval.
C. Drainage Aggregate: Angular, clean stone or granular fill meeting the following gradation as determined in accordance with ASTM D422:

1. Sieve Size 1 inch (25 mm): 100 percent passing.
2. Sieve Size 3/4 inch (19 mm): 75 to 100 percent passing.
3. Sieve Size No. 4: 0 to 60 percent passing.
4. Sieve Size No. 40: 0 to 50 percent passing.
5. Sieve Size No. 200: 0 to 5 percent passing.

D. Drainage Pipe: One of the following; with or without geotextile filter wrap.

1. Perforated or slotted polyvinyl chloride (PVC) complying with ASTM D 3034.
2. Corrugated high density polyethylene (HDPE) complying with ASTM F 405.

E. Soil Material for Reinforced Backfill: Inorganic USCS soil types GP, GW, SW, SP, or SM, free of debris, or other material approved by design engineer, and:

1. Meeting the following gradation, as determined in accordance with ASTM D422:
   a. Sieve Size 4 inches (100 mm): 100 percent passing.
   b. Sieve Size No. 4: 20 to 100 percent passing.
   c. Sieve Size No. 40: 0 to 60 percent passing.
   d. Sieve Size No. 200: 0 to 35 percent passing.

2. Maximum particle size of poorly-graded gravels (GP) (no fines) not exceeding 3/4 inch (19 mm) unless expressly approved by design engineer and long-term design strength (LTDS) of geosynthetic is reduced to account for additional installation damage from largest particles.


PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify location of existing structures and utilities prior to excavation.

B. Protect adjacent structures from the effects of excavation. Excavation support, if required, is responsibility of Contractor.

3.2 INSTALLATION

A. Install in accordance with approved Wall Design Drawings and unit manufacturer's instructions.

B. Take precautions to minimize over-excavation. Fill over-excavated areas with compacted soil material for reinforced backfill or leveling pad material at no extra cost to Owner.
C. Following excavation, the Geotechnical Engineer shall examine the bearing soil surface to confirm that soil strength meets or exceeds the assumed design bearing strength. Replace soils not meeting the required strength with satisfactory soils as directed by the Geotechnical Engineer.

D. Lay up wall to dimensions within plus/minus 1 inch (25 mm) from plan locations and within plus/minus 2 degrees face cant from design requirements.

E. Compact fill and backfill to 95 percent of maximum standard Proctor density, in accordance with ASTM D 698 at moisture content within 2 percent of optimum.

F. Use only hand-operated compaction equipment within 36 inches (915 mm) of back of wall units.

G. At the end of each day's operation, slope the top of backfill away from the wall.

H. At completion of wall construction, if other work such as finish grading, paving, landscaping, or storm drainage adjacent to the wall is not to be installed immediately, grade the top of backfill and provide temporary drainage as required to prevent water runoff toward the wall.

3.3 PROTECTION
A. Prevent damage to wall and earthwork by subsequent construction and uncontrolled runoff until Substantial Completion.

B. Do not operate or allow others to operate heavy paving or grading equipment within 36 inches (1 m) from the back of the wall face.

C. Do not operate or allow others to operate equipment with wheel loads in excess of 150 psf (1000 kPa) live load within 10 feet (3 m) of the face of the retaining wall.

D. Do not place or allow others to place temporary soil or fill stockpiles adjacent to wall.

E. Repair damage due to failure to protect wall or earthwork.

3.4 DISPOSAL
A. Except for material indicated to be recycled, remove excavated materials and damaged or remaining pieces of block from Project site and legally dispose of them in an EPA, NHDES and NHDOT-approved facility.

1. Do not allow debris materials to accumulate on-site.

END OF SECTION 323113
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Seeding.

1.02 STANDARD REFERENCE

A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans and specifications are to be used in tandem; where one conflicts with the other, the most costly and higher quality requirement will govern.

B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".

C. New Hampshire Department of Environmental Services, Alteration of Terrain design standards, latest revision.

D. EPA-Construction General Permit, Notice of Intent and Storm Water Pollution Prevention Plan.

1.03 DEFINITIONS

A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

I. Surface Soil: Whatever soil is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Certification of grass seed.
   1. Certification of each seed mixture.

C. Product certificates.

1.05 QUALITY ASSURANCE

A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
   1. Pesticide Applicator: State licensed, commercial.

B. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory.
   1. The soil-testing laboratory shall oversee soil sampling.
   2. Report suitability of tested soil for turf growth.
      a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
      b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
1.07 MAINTENANCE SERVICE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:

1. Seeded Turf: 60 days from date of planting completion.

    a. When initial maintenance period has not elapsed before end of planting season, or
    if turf is not fully established, continue maintenance during next planting season.

PART 2 - PRODUCTS

2.01 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as follows:

1. New England Warm Season Grass Mix

    a. Little Bluestem (Schizachyrium scoparium)
    b. Switchgrass (Panicum viratum)
    c. Big Bluestem (Andropogon gerardi)
    d. Creeping Red Fescue (Festuca rubra)
    e. Indiangrass (Sorghastrum nutans)
    f. Silky Wild Rye (Elymus villosus)
    g. Virginia wild-Rye (Elymus virginicus)

C. Grass Seed Mix: Proprietary seed mix as follows:

1. Products: Subject to compliance with requirements, provide the following: New England Wetland Plants, Inc., native seed mixes, New England Warm Season Grass Mix.

2.02 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.

2. Class: O, with a minimum of 95 percent passing through No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through No. 60 (0.25-mm) sieve.
B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.

G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.03 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch (12.5-mm) sieve; soluble salt content of 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.

C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.

E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.04 FERTILIZERS

A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2.05 PLANTING SOILS

A. Planting Soil: Existing, in-place surface soil. Verify suitability of soil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:

3. Weight of Lime per Acre: 2 Tons.
4. Weight of Slow-Release Fertilizer per Acre: 500 lbs.

2.06 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.07 PESTICIDES

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

PART 3 - EXECUTION

3.01 TURF AREA PREPARATION

A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches (150 mm), Remove stones larger than 2 inches (50 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply fertilizer directly to subgrade before loosening.
2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
3. Spread planting soil to a depth of 6 inches (150 mm) but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.02 SEEDING

A. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 23 lb/Acre.

C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 1.5 tons/acre to form a continuous blanket 1-1/2 inches (38 mm) in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

3.03 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

B. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain height appropriate for species without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings.

C. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

3.04 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by the Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.
END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Drains, drain manholes and catch basins.

1.02 STANDARD REFERENCE

A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans and specifications are to be used in tandem; where one conflicts with the other, the most costly and higher quality requirement will govern.

B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".

C. New Hampshire Department of Environmental Services, Alteration of Terrain design standards, latest revision.

D. EPA-Construction General Permit, Notice of Intent and Storm Water Pollution Prevention Plan.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Drain Manholes: Include plans, elevations, sections, details, frame and covers.
   2. Catch Basins: Include plans, elevations, sections, details, frame and grates.
   3. Trench Drain: Include plans, elevations, sections, details, frame and grates.

B. Product Certificates: For each type of pipe and fitting, from manufacturer.

C. Field quality-control reports.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.
C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle and store crushed stone as not to mix it with any other on-site soil.

1.05 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager no fewer than 2 days in advance of proposed interruption of service.

2. Do not proceed with interruption of service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.01 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.


B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.


2.02 PVC PIPE AND FITTINGS

A. PVC Cellular-Core Piping:

1. PVC Cellular-Core Pipe and Fittings: ASTM F 891, Sewer and Drain Series, PS 50 minimum stiffness, PVC cellular-core pipe with plain ends for solvent-cemented joints.

2. Fittings: ASTM D 3034, SDR 35 PVC socket-type fittings.

3. Piping in first paragraph below is available in NPS 4 to NPS 36 (DN 100 to DN 900). Joints are gasketed type.

2.03 CONCRETE PIPE AND FITTINGS


B. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76 (ASTM C 76M).
   1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C 443 (ASTM C 443M), rubber gaskets
   2. Class II, Meet NHDOT specification.
   3. Class III, Meet NHDOT specification.
   4. Class IV, Meet NHDOT specification.
   5. Class V, Meet NHDOT specification.

2.04 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:
   1. Description: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:
   1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

2.05 DRAIN MANHOLES

A. Standard Precast Concrete Manholes:
   1. Description: ASTM C 478 precast, reinforced concrete, of depth indicated, with provision for sealant joints.
   2. Inside Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
   3. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 5-inch (125-mm) minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
4. Riser Sections: 5-inch (125-mm) minimum thickness, of length to provide depth indicated.
5. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Resilient Pipe Connectors: ASTM C, cast or fitted into manhole walls, for each pipe connection.
8. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 30-inch (762-mm) ID by 8-inch (200-mm) riser, with 4-inch- (100-mm-) minimum-width flange and 31-3/4-inch- (807-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "DRAIN." Material: ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

2.06 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Inside Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 5-inch (125-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 5-inch (125-mm) minimum thickness, of length to provide depth indicated.
6. Top Section: Concentric-cone or flat-slab-top type. Top of cone of size that matches grade rings.
8. Resilient Pipe Connectors: ASTM C, cast or fitted into catch basin walls, for each pipe connection.
9. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Frames and Grates:

1. Paved Area: ASTM A 536, Grade 60-40-18, ductile iron designed for H-20, structural loading. Grate shall be NHDOT Type B Alt. 1. Include flat grate with small square or short-slotted drainage openings.
   a. Size: 23-11/16" by 21-1/2" minimum unless otherwise indicated.
   b. Grate Free Area: Approximately 50 percent unless otherwise indicated.
2. Outlet Structures: ASTM A 536, Grade 60-40-18, ductile iron designed for H-20, structural loading. Grate shall be NHDOT Type B Alt. 1. Include flat grate with small square or short-slotted drainage openings.
   a. Size: 23-11/16” by 21-1/2” minimum unless otherwise indicated.
   b. Grate Free Area: Approximately 50 percent unless otherwise indicated.

3. Grass Areas: ASTM A 48, light duty gray iron. Grate shall be Neenah R-4353 or equal. Include beehive grate.
   a. Size: 25 5/8” Diameter by 9” high minimum unless otherwise indicated.
   b. Grate Free Area: 1.8 square feet open.

2.07 TRENCH DRAINS

A. Trench Drains:
   2. Body Material: Precast Concrete.
   3. Flange: Type L - cast iron rails.
   4. Clamping Device: Threaded Rod
   5. Outlet: End
   6. Grate Material: Cast Iron Type "A".
   7. Grate Finish: Not required.
   8. Dimensions of Frame and Grate: 14" by 24".

2.08 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318 and the following:
   1. Cement: ASTM C 150, Type II.

B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.
   2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
   1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
      a. Invert Slope: 1 percent through manhole.
2. Benches: Concrete, sloped to drain into channel to be 1 inch above the crown of the highest pipe.
   
   a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

   2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.09 **BRICK**

A. General: Option for frame adjustment, invert and shelf construction shall comply with the following:

   1. Brick Type: ASTM C32-05, Clay or Shale, Grade SS Hard Brick.
   2. Mortar: 1 part by volume of Portland Cement, 2 parts by volume, damp washed coarse sand, and potable water to produce a consistency of stiff paste.

B. Manhole Channels and Benches:

   1. Channels: Brick and Mortar invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

      a. Invert Slope: 1 percent through manhole.

   2. Benches: Brick and Mortar, sloped to drain into channel to be 1 inch above the crown of the highest pipe.

      a. Slope: 4 percent.

2.010 **BIO-RETENTION SYSTEM**

A. Bio-Retention System: Shall be constructed with all appurtenances shown on the Contract Drawings.

2.011 **ADS YARD DRAIN**

A. Yard Basins shall be ADS Drain Basin by Nyloplast with ADS N-12, SDR 35 Sewer PVC, Schedule 40 PVC pipe, HDPE pipe or substitution will need to be approved by Engineer. See drawings and details in the Construction Drawings.
PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.02 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

E. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.

2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.

3. Install piping with 48-inch (1220-mm) minimum cover.

4. Install PE corrugated sewer piping according to ASTM D 2321.

5. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

6. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

7. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:


2. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
3. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.

4. Join dissimilar pipe materials with nonpressure-type flexible couplings.

5. Join nonreinforced-concrete sewer piping according to ASTM C 14 (ASTM C 14M) and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.


3.04 DRAIN MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Form continuous concrete or brick channels and benches between inlets and outlet.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops above finished surface elsewhere and grade surface to meet cover.

3.05 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.06 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.07 TRENCH DRAIN INSTALLATION

A. Trench drain system shall be furnished and installed in strict accordance with the Construction Drawings, product specifications/guidelines and as directed by the Architect/Engineer.

3.08 CONNECTIONS


3.09 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
1. Use warning tape or detectable warning tape over ferrous piping.

2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.010 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.

2. Defects requiring correction include the following:
   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
   c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.

2. Test completed piping systems according to requirements of authorities having jurisdiction.

3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.

4. Submit separate report for each test.

5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
   a. Exception: Piping with soil-tight joints unless required by authorities having jurisdiction.
   b. Option: Test plastic piping according to ASTM F 1417.
B. Leaks and loss in test pressure constitute defects that must be repaired.

C. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.011 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION
SECTION 33 71 19

ELECTRICAL UNDERGROUND DUCTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Conduit, ducts, and duct accessories for single duct runs.
   2. Handholes and boxes.

1.02 STANDARD REFERENCE

A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans and specifications are to be used in tandem; where one conflicts with the other, the most costly and higher quality requirement will govern.

B. Reference is made to items and paragraphs of the 2010 edition, of "Standard Specifications for Road and Bridge Construction", State of New Hampshire Department of Transportation. References in this section to these Standard Specifications bear the prefix "NHDOT".

1.03 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed 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.


D. CPVC: Chlorinated polyvinyl chloride plastic.

E. PE: Polyethylene plastic.

F. PVC: Polyvinyl chloride plastic.

1.04 SUBMITTALS

A. Product Data: For conduit, pads, handholes, and boxes.
B. Shop Drawings for Factory-Fabricated Handholes and Boxes: Include dimensioned plans, sections, and elevations, and fabrication and installation details

C. Field quality-control test reports.

1.05 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

1.06 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. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.07 COORDINATION

A. Coordinate installation with utility prior to ordering materials.

B. Coordinate installation of required supporting devices and other structural components as they are constructed.

PART 2 - PRODUCTS

2.01 CONDUIT


B. RNC: NEMA TC 2, Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

C. SCH 40 PVC: Rigid polyvinylchloride ASTM PVC 2110, Type 2, Grade 1, with matching fittings from the same manufacturer.

1. Solvent Cements for Joining Plastic Piping:
   a. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
   b. PVC to ABS Piping Transition: ASTM D 3138.

2.02 TRANSITION FITTINGS

A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
B. Transition Couplings NPS 1-1/2 (DN 40) and Smaller:

1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
2. Aboveground Piping: Specified piping system fitting.

C. Plastic-to-Metal Transition Fittings:

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:
   a. Spears Manufacturing Co.

2. Description: PVC one-piece fitting with manufacturer's Schedule 40 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint or threaded end.

D. Plastic-to-Metal Transition Unions:

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:
   a. Colonial Engineering, Inc.
   b. NIBCO INC.
   c. Spears Manufacturing Co.

2. Description: MSS SP-107, PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

2.03 NONMETALLIC DUCTS AND DUCT ACCESSORIES

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. ARNCO Corp.
2. Beck Manufacturing.
3. Cantex, Inc.
6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX Inc.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT; a division of Cable Design Technologies.
11. Spiraduct/AFC Cable Systems, Inc.
C. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Division 31 Section "Earth Moving."

2.04 HANDHOLES AND BOXES

A. Description: Comply with SCTE 77.

2. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, as indicated for each service.
7. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

B. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers of fiberglass.

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Carson Industries LLC.
   b. Christy Concrete Products.
   c. Nordic Fiberglass, Inc.

2.05 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
PART 3 - EXECUTION

3.01 EARTH MOVING

A. Excavation and Backfill: Comply with Division 31 Section “Earth Moving”.

B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sapping, and mulching. Comply with Division 32 Sections "Turf and Grasses".

D. Cut and patch existing pavement in the path of underground ducts and utility structures according to Division 31 Section “Site Clearing” and Division 32 Section “Asphalt Paving”.

3.02 DUCT INSTALLATION

A. Slope: Pitch ducts away from buildings and equipment. Slope ducts from a high point in runs.

B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1220 mm), both horizontally and vertically, at other locations, unless otherwise indicated.

C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

D. Duct Entrances to Handholes: Use end bells, spaced approximately 10 inches (250 mm) o.c. for 5-inch (125-mm) ducts, and vary proportionately for other duct sizes.
   1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line.
   2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole.
   3. Grout end bells into structure walls from both sides to provide watertight entrances.

E. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet (3 m) outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as shown on Contract Drawings and make water tight.

F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.

G. Pulling Cord: Install 100-lbf- (445-N-) test nylon cord in ducts, including spares.
3.03 INSTALLATION OF HANDBOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.7-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and traffic ways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

E. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.04 GROUNDING

A. Ground underground ducts and utility structures according to current electrical regulations.

3.05 GROUTING

A. Mix and install grout for conduit penetrations.

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 around conduits and provide smooth surface at wall penetrations.

G. Cure placed grout.

3.06 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.

2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.

3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance.

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.07 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of handhold. Remove foreign material.

END OF SECTION